THE

# JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXI. No. 788.] LONDON, JUNE 18, 1878. [30TH YEAR.] Price 6d.

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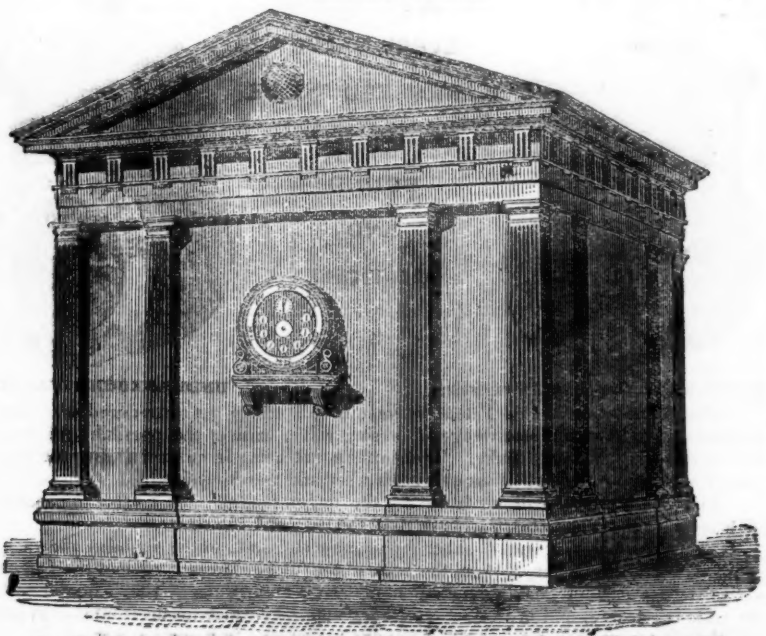

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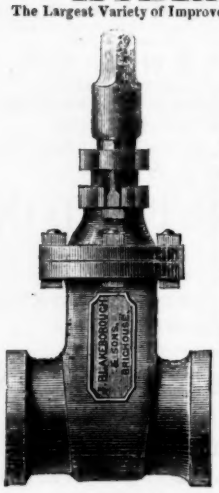


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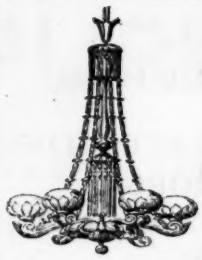

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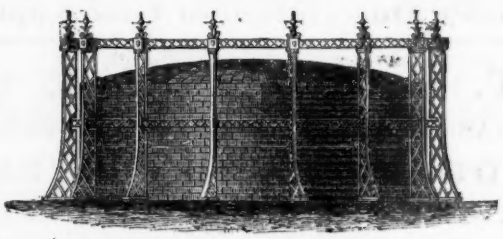

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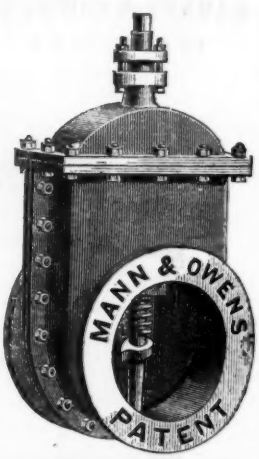


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The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

SOLE MANUFACTURERS:
**S. OWENS AND CO.,**
HYDRAULIC AND GENERAL ENGINEERS,
WHITEFRIARS STREET, LONDON, E.C.
PRICES, SIZES, AND FULL PARTICULARS ON APPLICATION.

# TANGYE BROTHERS AND HOLMAN,

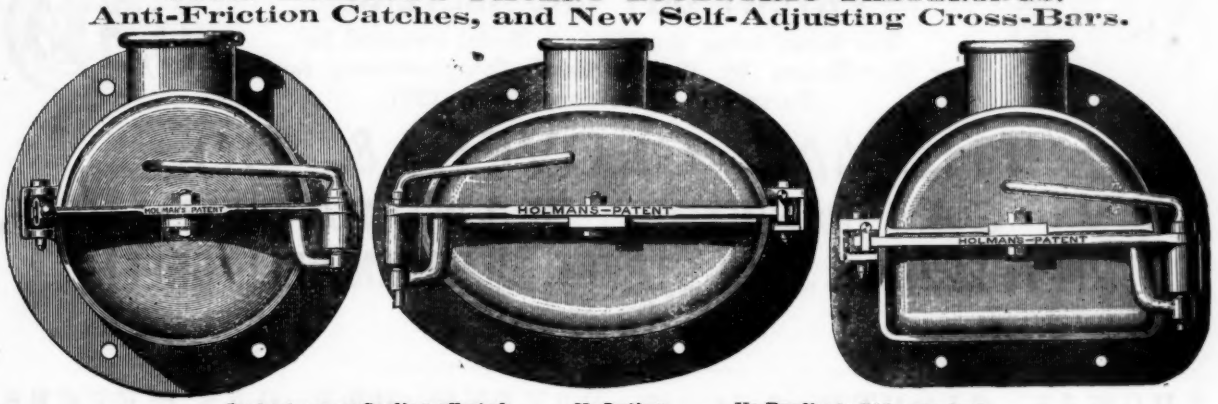
## CORNWALL HOUSE, 35, VICTORIA ST., LONDON, E.C.

(LATE OF 10, LAURENCE POUNTNEY LANE.)

## SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

**WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS.**

**Anti-Friction Catches, and New Self-Adjusting Cross-Bars.**




**Instantaneous Sealing effected. No Luting. No Duplicate Lids required.**

**Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.**

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

**T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.**

**D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—**

**The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.**
**And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland**

## HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

**These Governors have been adopted by many leading Gas Companies, among whom are the following:—**

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

### TESTIMONIAL.

*The Gaslight and Coke Company,*
*9, Water Street, New Bridge Street,*
*Blackfriars, E.C., Feb. 27, 1875.*

MESSRS. TANGYE BROTHERS AND HOLMAN.

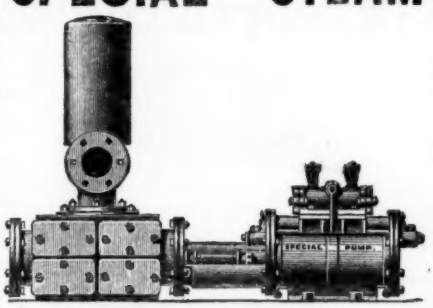
Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

**PRICES AND FULL PARTICULARS ON APPLICATION.**

## THE "SPECIAL" STEAM-PUMP.

| Diameter of Steam Cylinder. | Diameter of Water Cylinder. | Length of Stroke. | Gallons of Water per Hour, Approximate. | Reduced Prices. |
|---|---|---|---|---|
| 3 | 1½ | 9 | 450 | £16 |
| 4 | 2 | 9 | 815 | 18 |
| 5* | 2½ | 12 | 1,250* | 20 |
| 5* | 3 | 12 | 1,830* | 22 10 |
| 4 | 4 | 12 | 3,250 | 25 |
| 6* | 4 | 12 | 3,250* | 30 |
| 5 | 5 | 12 | 5,070 | 32 10 |
| 7* | 5 | 12 | 5,070* | 40 |
| 6 | 6 | 12 | 7,330 | 40 |
| 8* | 6 | 12 | 7,330* | 50 |
| 7 | 7 | 12 | 9,750 | 50 |
| 10* | 7 | 12 | 9,750* | 65 |




In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

**TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.**

*FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.*

London, 1851. New York. 1853. Paris, 1855. London. 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

**PATENT DRY GAS-METERS,**

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

# THOMAS GLOVER & CO.,

## DRY GAS-METER MANUFACTURERS,

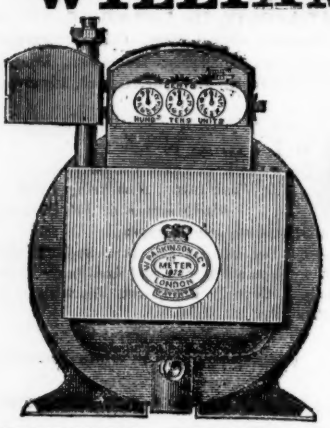
## 214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

## LONDON, E.C.

### THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

# WILLIAM PARKINSON AND CO.,



(ESTABLISHED 1816,)

MANUFACTURERS OF

# WET & DRY METERS,

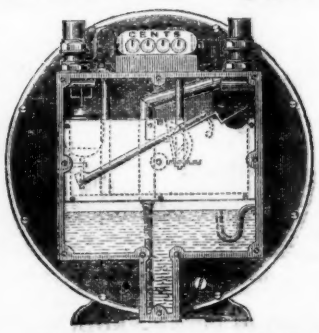
STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

## HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

**COTTAGE LANE, CITY ROAD, LONDON, E.C.**

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# THE JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

*TUESDAY, JUNE* 18, 1878.


## Circular to Gas Companies.

We wrote last week upon the advantage of Gas Exhibitions, and in view of the contemplated visit of the Gas Managers to the Paris Exposition Universelle, we must, however unnecessarily, call the attention of our readers to the Pavilion in which the Compagnie Parisienne du Gaz have brought together a most perfect collection of everything illustrating the manufacture and distribution of coal gas. It may not be quite correct to say everything; for, of course, they cannot show, in actual operation, in an exhibition of this kind, the Siemens furnace, which is largely used by the Paris Company, but which has not, for reasons we do not understand, obtained employment in this country. An exhibition such as is to be seen now in Paris would not be possible in this Metropolis, except under similar conditions; and for these, we fear, we shall have to wait for many years. English manufacturers are rather tired of these great International Shows. They cannot be said to pay; thus the interest in them flags. Nevertheless, we still hope to see a grand exhibition of gas apparatus in London; but, before such a display as that to be now seen in Paris can be brought together here, there must, as in the French capital, be but one Company.

Could the Directors of the London Companies who have visited Paris have had sufficient time to give a full and fair consideration to the circumstances of the Paris Company, they must have left the French Metropolis with a strong conviction of the advantages of unity of management, or, say, of amalgamation. The ten manufacturing stations of the Company are all governed by the same Board, and a study of the accounts will reveal the economy which results from a concentration of management. More than this, we believe that the working details of each separate establishment will illustrate the good effect of supervision by one head. The Managers of the various stations are a superior class of men, and, under the direction of one of the ablest Engineers in France, they must necessarily work to greater advantage than they would if each one carried out his own ideas. Still the Managers are not at all fettered in their efforts to introduce improvements which may suggest themselves to their minds, and we owe to some of them many advances in our manufacture; but all is done under the control of a General Board, among whom may be found some men of great eminence in the scientific world. The advantage of having one body to carry out the business details will be apparent to every one. If we look at coal contracts alone, it is certain that a great saving must result from purchasing the raw material for all the stations at the same time. As the Paris Company work up their own residuals, we cannot say what would be the consequences if they made a single contract for the disposal of all these separately. One great advantage which will presently result from the amalgamations that have been carried out in this Metropolis will, we expect, be a large profit from the working up of residuals. Supposing all the Metropolitan Companies united, a much larger field for manufacturing operations of this kind would be opened up, which, if well cultivated, must end in a large increase of profit to the united Company.

With our complicated municipal arrangements, it would be difficult, under any circumstances, to introduce the plan which puts the Municipality of Paris and the Gas Company in perfect accord—namely, the equal division of profits over ten per cent. We can easily imagine the delight which would be felt in Spring Gardens at the prospect of sharing in the profits of our Companies. The sliding scale would never have been dreamed of, and the standard price might have been anything. It would be premature, however, to speculate upon contingencies which may never arise, and we shall not now attempt to indicate a course of policy which, while leaving the one Gas Company in possession of their property, would, at the same time, satisfy the wishes of our Local Authorities. They long for gas profits, and it may be possible to afford them the luxury without confiscation. Of Paris, the Gas Exhibition, and the arrangements of the Compagnie Parisienne du Gaz we shall presently have more to say; for the moment, we leave it with the suggestion that all Metropolitan Directors who visit Paris should study the admirable system pursued in that city, in which case we are certain they will come home fully convinced of the benefits of amalgamation.

The annual report of the Metropolitan Board of Works for 1877, which has just been issued, details very fairly the condition under which the London Gas Companies, who have been brought under modern legislation, now pursue their business; but the Board have not the grace to acknowledge that, as regards illuminating power and purity, the Companies faithfully fulfil their obligations. The report observes that the sliding scale is working advantageously, both for the Companies and the public. It may be so, but we are by no means certain that the public might not have been better served without the sliding scale. Of the effect of auction clauses we cannot at present say anything. It will be some years before they are brought into operation, and the consequences of them will hardly be felt in the present generation. Future consumers may possibly realize some benefits from their adoption, but it is impossible to foresee what may be the circumstances of gas industry twenty or thirty years hence.

The testing of gas-meters continues to be profitable to the Board, but the profits do not now pay the expenses of the Examiners who report upon illuminating power, &c. It is right to say, however, that heavier costs fall upon the Gas Companies than upon the Metropolitan Board. The Chief Gas Examiner, the Referees, and the Auditor constitute a charge which is really an onerous burden upon them. By rights, the public should pay this charge, for it is incurred for their protection, and it is against all precedent in English jurisprudence that Companies should be fined for this kind of supervision. It is said that when a man is bastinadoed in Turkey he pays the beater, and also the man who counts the strokes. Gas Companies are mulcted much the same way in this country.

The Brighton Board of Guardians have resolved upon making their own gas for the supply of the Industrial Schools. It seems that, in order to be supplied by the Black Rock Company, it would have been necessary to lay a main a mile long from the workhouse to the schools, which would have cost £756 5s., and, together with the fittings, would have involved an estimated expenditure of £996. The Committee calculated, however, that the cost of buildings, works, and fittings for the supply of 200 lights, would only amount to £1044, and they imagine that they can make gas for 2s. 3d. or 2s. 6d. per thousand, and have some residuals left for profitable utilization; so they have determined to supply themselves from their own works. We are not without fear that some mistakes have been made in the calculations of the Committee. After a year or two's trial of their system, they may possibly come to the con-

clusion that it would have been cheaper in the end to obtain a supply from the Old Brighton Company. In the meantime, their estimates will have been overhauled by the Local Government Board; for, before they can start gas-works, they must borrow money.

The Birmingham Exhibition of Gas Apparatus had a somewhat triumphant conclusion. It was considered so successful that it was continued open for two additional days, in the course of which numbers of the artizan class availed themselves of the opportunity of witnessing the display. It was natural that these should be most attracted by the cooking apparatuses, which received the greatest share of their attention. We hope that the cooking lessons on these occasions were better adapted to the wants of working men and women than were those which were taught us, much as we appreciated them. It was somewhat amusing to hear a lady who had spent, perhaps, ten minutes or a quarter of an hour over the concoction of a little sauce, announce to her hearers that cooking by gas was not the least trouble. The statement, however, was perfectly true; cooking is one thing, but mixing sauces another. The artizan and his wife are content to do without such delicate additions to dishes; and it should have been made plain to them that such cooking as they required could really be done, as the lady said, without the least trouble. Some artizans have seized the fact; but a difficulty has arisen, and a very natural one—the first cost of the apparatus. We have several times recommended English Gas Companies to follow the example of their Parisian contemporary, and let out apparatuses on hire. Corporations, in these days, affect to be paternal, and they may just as well follow up the principle. Cooking-stoves and other apparatus, lent like meters, would be a great boon to the consumers, and would bring some profit to the suppliers of gas. There is another side also to the question, which, we notice, has not been overlooked—that is, the pressure at which gas must be supplied during the day, if cooking-stoves were generally adopted. There is a fear among gas officials that great loss from leakage would result if a high pressure were maintained during the daylight hours; but we do not think that much anxiety need be felt on this ground, if mains be properly laid, and effective district governors be established.

The Stafford Gas Company have wound up their affairs, but a small hitch occurred in the final proceedings. The amount of purchase-money to be paid by the Corporation is £70,000, and of this the Directors proposed to divide £68,400, or twenty-eight and a half years purchase of dividends, *pro ratâ* among the Shareholders, leaving £1600 to be appropriated as the Shareholders might think fit. It was, of course, expected it would be voted to the Directors and the Manager, but the Proprietors did not seem to see it, and, in the end, it was decided to divide the whole amount of £70,000, and privately raise a testimonial to the Directors and Manager. We cannot say that this is grateful conduct on the part of the Shareholders, for the Board have worked well in their interest, and have received but scanty remuneration. For years, some of those who were in office when the Company were transferred received no *solatium* at all, and of late years, when the Company became prosperous, obtained but small pecuniary recognition of their services.

Small matters sometimes involve great principles. The diminutive Local Board of Whittington have been for more than a year negotiating for the purchase of the gas undertaking within their limits. Now, however, when they might obtain them, they decline to purchase, on the sensible grounds that the times are depressed, and the borrowing powers of the Board limited. It is gratifying to see even a small Local Board hesitating to run into debt.

Another application has been made to the Recorder of Liverpool to appoint an official Auditor, under the Gas-Works Clauses Act, 1847, to go through the accounts of the United Gas Company for the past year. We can hardly imagine any necessity for this proceeding, but we are certain that the Company have no objection to any number of official Auditors going through their accounts. It is a small piece of paltry spite on the part of one or two members of the Town Council, who will doubtless be chagrined when the Auditor reports that he finds the accounts perfectly correct.

Some accident must have happened at the gas-works at Weymouth, for terrible complaints were made last week of a stench which pervaded part of the town, and which was evidently sulphuretted hydrogen emanating from the gas-works. We believe the Weymouth Company manufacture sulphate of ammonia on the works, and probably some disarrangement of the apparatus allowed the escape of the gas which excited so many complaints. It has been said so many times in these columns that the statement hardly needs repetition, that the transference of liquor from one part of the works to another, and the manufacture of sulphate of ammonia, need not occasion disgust to the most delicate nose.

Under the superintendence of Mr. E. J. Reed, C.B., some improvement has been made in the electric light. But the Moderator Electric Lamp still lacks all the elements which would be calculated to fit it for the illumination of small areas. Gas still holds its own for lighting shops and dwelling-houses, and we venture to predict that for many years to come nothing will be discovered to supersede it. In the meantime, our contemporaries report that the lighting of the Boulevard des Capucines and the Rue de l'Opéra continues to be highly successful. Our readers, when they pay a visit presently to Paris, should give a careful inspection to this display, remembering our dictum, that while the electric light is eminently adapted for the illumination of public spaces, it cannot for a moment invade the strongholds of Gas Companies.

## Water and Sanitary Notes.

Why there should be any mystery about treating sewage with a little lime, collecting the sludge, drying it, and then burning it in a kiln, we cannot imagine; but when we write to a friend at Burnley for information, which we know is never given at meetings where bottles of sewage and effluent water are exhibited and a luncheon follows, we are told that "the gates of the "sewage-works are guarded most carefully against intruders." Why, if cement of such strength as good Portland and Roman cement can be made at Burnley, ought there to be any secrecy about the matter? According to the report we find in the *Journal of the Society of Arts*, the compost finds a ready sale, and is of excellent quality. If such be the case, General Scott's success may be considered certain, although the price of cement, as made in the ordinary way, must be greatly reduced. We cannot, however, yet recommend the system to Local Authorities, much having to be established before the cement can be deemed a commercial commodity. When the mixture of lime and sewage overflows at Birmingham, it will do very well to stick the blades of Lord Norton's grass together, but we must have strong testimonials from architects who have been engaged in other than Government buildings, before we can regard sewage cement as an article worthy the attention of builders and contractors.

The Southwark and Vauxhall Water Company, we are happy to say, are progressing. For the past half year they will pay a dividend of three per cent., in place of the two and a half paid in the previous half year. We have before said that the district of the Company has been greatly under-rated, but the additions made in parts of the district have excited a hostile spirit. We are glad, then, to learn that in future the Directors will give due notice of any increase in the rating. This, while it cannot affect the legal rights of the Company, will be satisfactory to consumers, and will, no doubt, allay the irritation which now prevails. The prospects of the Company are excellent, and nothing but very bad management can stand in the way of a revival, which will in a short time bring the finances of the Company back to the position they held a year or two ago. We strongly advise Shareholders to retain their interest in the Company, and not part with property the value of which at no long date will be doubled.

It is certain that any attempt on the part of the Water Committee of the Town Council of Liverpool to obtain water from any of the affluents of the Severn will be stoutly opposed, both by the River Authorities and the towns and cities which lie on the banks. On the one hand, it is contended that to abstract water from the upper part of the river would spoil the salmon-breeding grounds, and, on the other hand, towns like Worcester, which contribute a large amount of sewage to the river, are naturally anxious to have a large bulk of water to dilute their filth. Worcester, it may be, to-day, may not look with much interest on the salmon-breeding grounds, for years ago local legislation interfered to protect the apprentices of the city from being compelled to eat salmon more than three times a week. There are other schemes before the Corporation of Liverpool which will not excite the opposition that will certainly be brought against the Verniew source. They may be a little more expensive, but with water of equally good quality it little matters whence it comes, and at what cost it is brought.

The Prince of Wales's residence at Sandringham has received an effective supply of pure water at the hands of Mr. R. Rawlinson, C.B. The source is a well in the chalk, from which the water issues with a hardness of seventeen degrees; but, by Clark's process, this is reduced to about six degrees. It is raised to a tank which is situated considerably above the highest part of the house; so that, by the use of hydrants, which are freely

distributed, the premises are securely protected from destruction by fire. The village of West Newton is supplied from the same source. It is hardly necessary to add that the works have been carried out under the superintendence of Messrs. Lawson and Mansergh.

The new colliery district in the neighbourhood of Nottingham is in want of water, and will presently require a good deal of that element. The Hucknall Torkard Local Board proposed to supply this want, and, in order to do so, applied for a Provisional Order, which, if granted, would have given them power to sink a well in close proximity to one belonging to the Nottingham Water Company. The Order, however, which was opposed in Parliament, was not granted, and the Hucknall Board may now, as they were originally offered, take a supply in bulk from the Nottingham Company. It was offered at the ridiculously low rate of twopence per thousand gallons; but now that the Board have been defeated, we imagine higher terms will be demanded, and thus there will be another illustration afforded of the short-sighted policy of Local Authorities.

The action taken by Earl Redesdale has placed the Bill of the Durham Water Company in great peril; but some difficulties lie in the way of the opposing party. The requirements of the Borough Funds Act are very stringent, and tend, as they were meant to do, to cause delay. There is one hope, however, for the opponents of the measure—Lord Redesdale may exert his influence to secure its rejection on the third reading. It may be that this result would be beneficial to the Water Company themselves, who, before next session, might be able to select a source of supply preferable to the River Wear. It cannot be denied that this stream is enormously polluted above the intake of the Company, and it would really seem desirable that the inhabitants of Durham should be supplied from a purer source. The fact remains, however, as we stated last week, that Durham is a fairly healthy city, which is one more proof that there is very little connection between the condition of a water supply and the health of a population.

Truth to say, we are very much afraid that the letter of H.R.H. the Prince of Wales, which has been followed by a flood of talk in the Adelphi, and no little correspondence in the *Journal of the Society of Arts*, will, in the end, produce but little result. The question is a highly complicated one, and cannot be settled by a conference lasting two days, and correspondence extending over two weeks. Years must pass, and many social changes must take place, before the community become perfectly alive to their wants, and experience shows how these can be best supplied. It is no new thing in this JOURNAL to assert that the first requirement, when the water supply of the whole country is considered, must be a hydrological survey, which will assign to each district a water-bearing area capable of supplying its wants without interfering with the necessities of its neighbours. We do not require a permanent Royal Commission. Existing Ordnance Maps will supply us pretty fully with all the information it is desirable to obtain, and a few gentlemen well skilled in the science of hydrology could in a short time arrange the materials for the use of Local Authorities. But then comes the difficult question—the water being found, how is it to be brought home to the village populations who require it. We put towns which are capable of taking care of themselves out of the question. All the water agitators of the day are concentrating their attention on the water supply of sparsely populated rural districts, commonly furnished with impure water from shallow wells, and sometimes utterly destitute of any water at all. To supply these would tax the energies of any Local Authority, and produce such a drain on the pockets of responsible ratepayers as could not be borne. There is, in fact, nothing to be done in most cases but to go on as we are going, and leave time, which heals all, to cure the difficulty. That there is a quantity of water procurable in this country, sufficient for more than four times the present population, is beyond doubt, and all that we can say is, that when the population is four times what it is now, the supply of water will probably be much more easy and less costly. Every village, or we may then call it a town, may have its reservoir and conduits. We may no longer witness the sight of two villages fighting for possession of a brook, which takes across a road a dribble of dirty water; nor find a hamlet of considerable size supplied by barrels on wheels, at the rate of one halfpenny a pailful. It must not be supposed we jest on a subject of the utmost importance to small communities; we merely wish to enforce an assertion often made here, that matters of this kind are not likely to be settled by talk and newspaper correspondence. We look for good results from Mr. Whalley's Act, for it most frequently lies in the power of a large landowner to make, at small cost, an adequate provision for the supply of water to his poorer neighbours, though they may sometimes be required to go some distance to fetch it.

## BIRMINGHAM EXHIBITION OF GAS APPARATUS.

It is gratifying to learn that the interest taken by the public in this Exhibition was so great, that the Committee determined to keep it open for two days longer than was originally intended. More than 10,000 persons were admitted to the Town Hall, and upwards of 2000 availed themselves of the opportunity of attending the cooking lessons, given by the Ladies Useful Work Association.

In our last number, reference was made by name to some of the principal exhibitors in the various classes into which the cooking and heating apparatus were arranged. There were, however, several exhibits not mentioned, which should not be allowed to pass unnoticed. Amongst these we may mention the following collection of products arising from the manufacture of coal gas:—

| | Exhibited by |
|---|---|
| Coke, Carbon, Ammoniacal Liquor, Tar, Spent Oxide | Corporation Gas Department. |
| 49 Samples of Coal Tar Products | Domeier and Co. |
| Products from Ammonical Liquor | Chance, Brothers, and Co. |
| Ditto | Southall, Brothers, and Barclay. |
| Specimen of Ammonia Alum | G. Skey and Co., Limited. |
| Samples of Tar Products | J. Bethell and Co. |
| Samples of Products from Spent Oxide | Gas Purification and Chemical Company, Limited. |
| Samples of Tar Paving and British Asphalte | J. Bradshaw and Co. |
| Preparation of Carbolic Acid | F. C. Calvert and Co. |
| Ditto | M'Dougall Brothers. |
| Samples of Coal Tar Derivatives | P. Harbis and Co. |

Amongst other miscellaneous exhibits, possessing great interest, may be mentioned:—

| | |
|---|---|
| A 5-feet Gasholder, Test-Table, and Float of Lights, Glazed Wet Meter, Glazed Dry Meter | Lancashire Gas-Meter Company, Limited, Falcon Works, Oldham. |
| Collection of Gas-Burners | Lovett and Whitehouse. |
| Self-Lighting Gas-Tap (fishtail, bat's-wing, and Argand) | G. Twigg and Son. |
| Experimental Meter, Collection of Burners, and Standard Gasholder | Corporation Gas Department. |
| Collection of Burners | Stadelmann and Co. |

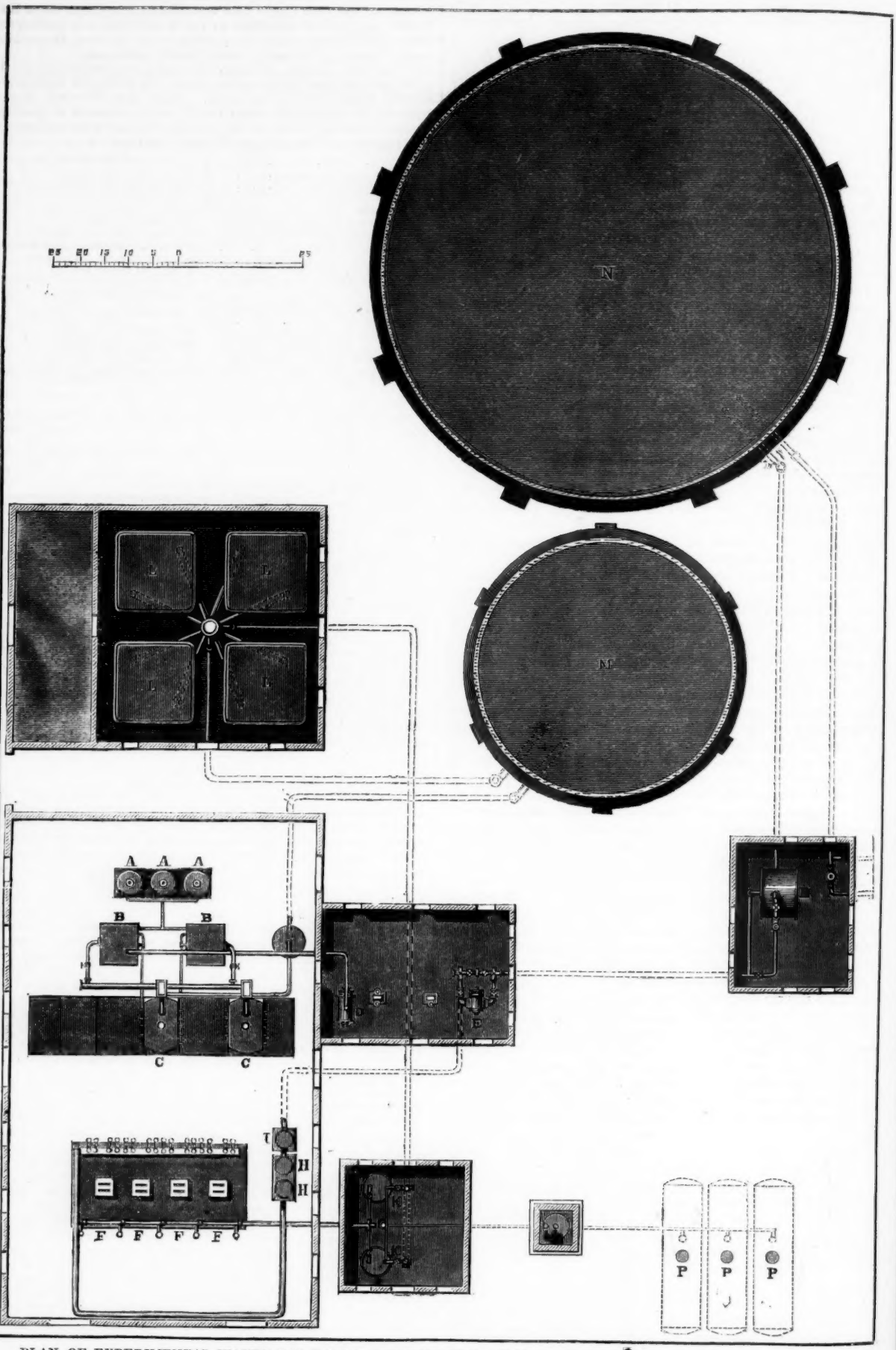
When noticing the gas-engine exhibited by Messrs. Louis Simon and Son, of Nottingham, last week, it was remarked that it did not appear to work so economically as some others. Referring to this observation, Messrs. Simon and Son write as follows:—"We exhibited a 1-horse power 'Eclipse' gas-engine working up to 1½-horse power, and ran it with a friction brake on. So weighted, it used about 50 cubic feet per hour, naturally more than the other engine which was only driving itself, but less, we believe, than any engine doing the same work would. As by obtaining steam from the heat of the exhaust we utilize the full mechanical effect of the combustion, it is only to be expected that our engine would use little gas."

We have been requested to state that Mr. T. D. Clare, of Handsworth, exhibited his patent open-fire ventilating stove, adapted for burning coke, breeze, coal, slack, or gas, in addition to the gas-stove for which he received the silver medal in Class 11.

## WATER GAS.

(*Continued from page* 910.)

The Municipal Gaslight Company of the city of New York were originated some three years ago. Their functions are the manufacture and sale of water gas, carburetted with naphtha to a high degree of luminosity, as a present business; and, as an adjunct to the business of the near future, the manufacture of a non-luminous gas for household heating, and for the use of various industries now dependent upon coal for fuel. The method of producing water gas which the Company employ (known in the United States as the Tessié du Motay system) is similar in principle to Kirkham's, and many others who have followed in his wake. But there are devices and adjuncts necessary to the production of a commercial gas which are the outcome of many experiments, some of them notable failures, which were instituted for, and at the expense of, the gentlemen who were the promoters of the Company, working under what is known as the Tessié du Motay patents. These have been added to and improved by the inventions of M. Jerzmanoski and others, and brought into practical shape by Mr. Thos. F. Rowland, of the Continental Works, Brooklyn. Mr. Rowland having had his attention called to the subject of water gas, in connection with a method of producing oxygen gas (also the invention of Tessié du Motay, which was introduced in the city of Buffalo, N.Y., some five or six years since, but proved a commercial failure), came to the conclusion that a thorough study of the details, and a practical carrying out of the scheme on a scale of sufficient magnitude, might make that a success in America, which, more than 20 years before, had been adjudged a failure in Europe. He therefore availed himself of the knowledge and experience of M. Jerzmanoski and other parties interested, and set to work to remove what he considered crudities, and to substitute other arrangements which he deemed necessary. This resulted in the erection of an experimental apparatus, with which he could produce gas having an illuminating power of 24 candles, capable of being consumed in any burner, and under all the circumstances to which gas, in the general way, is subjected. The satisfactory issue of this undertaking induced the gentlemen composing the Municipal Gaslight Company, under whose auspices all experiments were made, and who are the proprietors in the United States of the various patents under which the works are operated, to enter into an agreement with Mr. Rowland to build them works equal to the production of 500,000 cubic feet of gas per 24 hours, and equal in illuminating power to that produced by his experiments. On next page is a ground plan of these works.




PLAN OF EXPERIMENTAL WATER-GAS WORKS, CONSTRUCTED BY MR. T. F. ROWLAND, OF BROOKLYN, FOR THE MUNICIPAL GASLIGHT COMPANY, NEW YORK CITY.

A, A, A are the boilers that generate the steam required for all purposes. The steam to be converted, by decomposition, into combustible gas is raised to a high temperature by being passed through the superheaters, B, B. These also serve for the production of the hot blast, the air for which is supplied by the blower, D.

The gasogenes, or decomposing furnaces, C, C, are supplied with air and steam in a manner very similar to that specified by Kirkham, to which we have already referred. When the apparatus is fairly in operation, the coke or anthracite in these chambers is fully alight, and, therefore, only requires the hot blast turned on to either one of them, in order to bring a great portion of its contents up to a temperature expressed in Kirkham's specification, as equal to "the melting point of iron."

This heat having been arrived at, the blast by suitable means, is turned to the other gasogene, from which the steam is transferred to the one just spoken of as under the blast, so that by the time the steam has cooled this one below the decomposing temperature, the other will be again raised by the blast to the heat required to render its contents fit for the reception and decomposition of steam, and so on alternately and continually.

If we follow the pipes marked on the plan, we shall see that the gas from either of the gasogenes, after passing through a condenser, goes to the holder, M. From this holder, which acts as a mixer, the gas flows, as demanded, to the purifiers, L, L, and from thence to the carburetters, K, K. These are formed of a pile of pans, about 7 feet high, and so arranged that each pan has a certain quantity of naphtha in it, and is at the same time under the influence of a water bath that regulates its vaporization according to the rate at which the gas is passing over the naphtha surfaces. The gas having now become the bearer of hydrocarbon vapour, is conducted to retorts set in benches, F, F, and similar to those employed for the distillation of coal. Through a certain number of these retorts the gas has to pass to undergo the process called "roasting, or "fixing." This process is said to be so efficient that, after being stored in the holder, N (from which it is sent out for consumption), no miscarriage of luminosity is found to take place, even when tested for power at the most distant point of the district supplied. From the roasters the gas is drawn first through the condensers, H, H, and, finally, through a washer, I, by the exhauster, E. From this machine it passes through the station-meter, R, to the gasholder, N, where it is stored for consumption.

The demand for the gas so manufactured was such that the power of the works soon became fully occupied, and consequently the Company, in the early part of the year 1877, contracted with Mr. Rowland for the erection of new works, now complete, that should be equal to a make of 3 million cubic feet per day, the particulars of which will hereafter appear in the JOURNAL.

About the time that the suggestions by Tessié du Motay were under trial in the State of New York, and led Mr. Rowland to investigate the water gas question, a patent was taken out in this country by Mr. Lake, on behalf of William Harkness, of the United States, for "An Improved Process and Apparatus for making Illuminating Gas." The inventor lays great stress on the novelty of the process and apparatus, "the peculiarities of which" he explains to be "the production of illuminating gas by decomposing steam, and uniting the resulting gas, together with the gases given off by red-hot coal when the steam is passed through it with hydrocarbon vapours, by which a permanent or fixed gas of high illuminating power may be produced at a cheap rate." One of the novelties of this latter invention is the decomposition of steam in a vertical generator wherein gas from coal is at the time being evolved, in the same manner as claimed by Manby, with the exception that Manby —as was the practice in those days—provided the temperature necessary for evolving the gas from the coal, by the combustion of fuel on the outside of the vessel, whereas Harkness burns that which is required for producing the temperature for carbonizing his coal and decomposing the steam, within, as suggested and put in practice by Kirkham—with this difference, however, that Kirkham, and those known to us who have followed him, blew up their furnaces or generators by heated air supplied by a blower, whereas Harkness induces the air to pass upwards through the charge of coal by natural or artificial draught, the coal being "allowed to burn until the mass of the coal is red hot." It must be remembered that during this time the valve in the "smoke-pipe" is open, and we presume that the gas from the coal is going up this pipe as smoke; it will, therefore, never, by combination with gases from "red-hot coal" and steam and hydrocarbon vapours, help to produce a fixed gas of high illuminating power, and at a cheap rate.

Another part of the invention claimed by Harkness as of great importance, is the passing of the steam to be decomposed "downward through the mass of incandescent coal in the generators," instead of "upwards," as practised ever since the internal firing has been in vogue. The reason for this inversion is based on an assumption that the levity of the gas formed in the lower portions of the decomposing furnace makes it so uncontrollable that it will pass up the easiest and shortest route, without, therefore, filling "the entire cross-section of the generator." This would undoubtedly be the case if the gas was passing into a partial vacuum, such as might be created by an exhauster similar to that in use at the Municipal Works, but not while under pressure, as is the case there.

It will be seen, by reference to the plan of the Municipal Works, that the exhauster has nothing to do with the gasogene, but has all to do with the remainder of the apparatus. In this case, pressure compels the cross sectional occupation, so essential to the proper development of the power of this important part of a water gas plant—the gasogene.

The last-named patentee prefers to work with two cylindrical generators, which in elevation look as much like vertical steam-boilers as possible, their chimneys, or "smoke-pipes," having valves in them for a purpose to be explained by and by. "The generators, are partly or nearly filled with coal," resting on gratings or fire-bars, over ash-pits, consequently ready for firing.

The accompanying drawing, fig. 3, shows a front elevation of the apparatus.

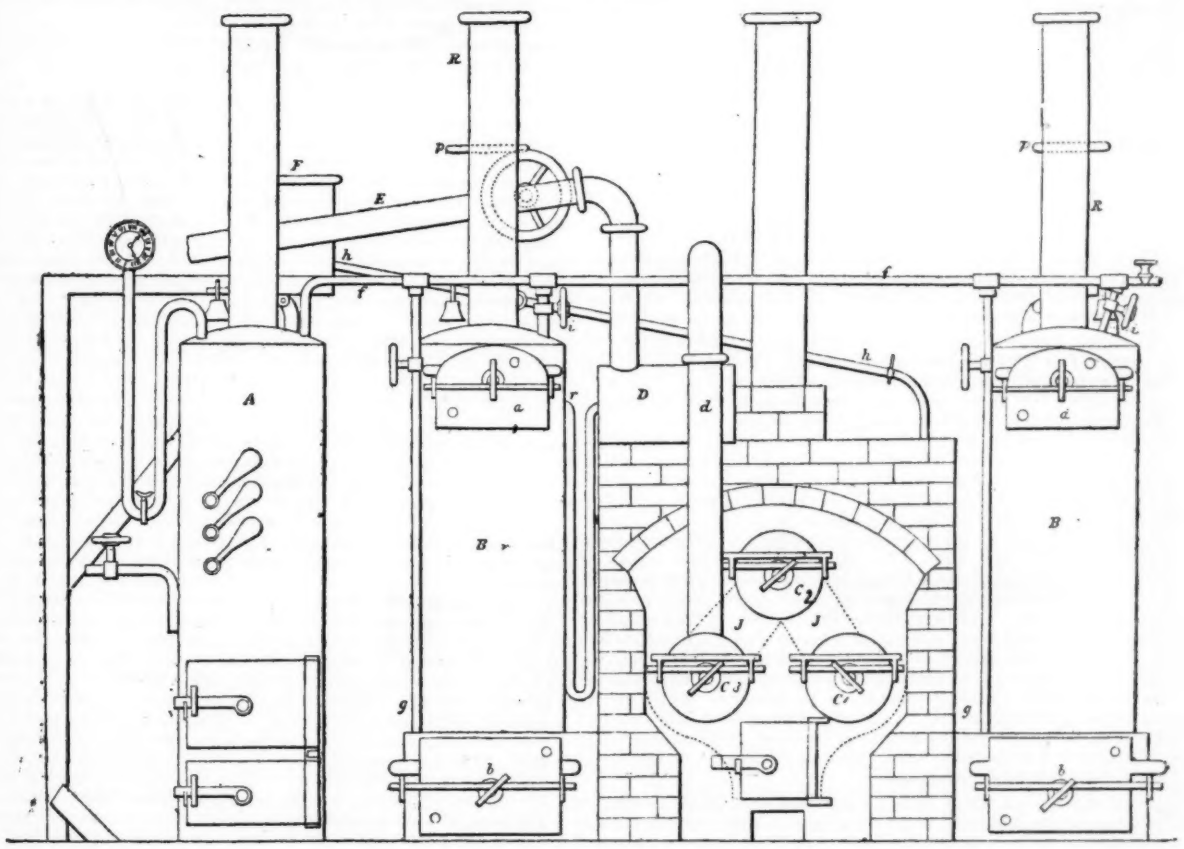



FIG. 3.

We must now suppose that the lids, *a* and *b*, are off, so that the ash-pits can be looked into, and the upper surface of the coal surveyed through the openings at *a*. As these generators are to be worked alternately, operations are commenced by kindling a fire under the coal in, say, the right-hand generator, taking care to open the valve, *p*, in the "smoke-pipe," R, in order to create the necessary draught. When the mass of coal is red hot, the lower door or lid, *b*, of the generator is closed, and rendered gas-tight by luting or otherwise. Steam is then admitted from the boiler, A, through the pipe, *g*, into the base of the generator, B, and, if the coal be of the proper temperature and condition, the steam thus admitted, as it ascends through the incandescent mass, will be decomposed and converted into a gas or vapour that will burn at the surface of the mass of coal. As soon as this is ascertained, the upper lid, *a*, is luted on, and the valve, *p*, in the smoke-pipe closed. We very much question the gas-tightness of this valve. If it be necessary to apply luting to the lids, *a* and *b*, for the purpose of preventing leakage, we think something more will be required in the "smoke-pipe" than what is proposed. The valve on the steam-pipe, *g*, is now closed, and the valve, *i*, is opened, to admit steam into the generator above the coal, It then passes "down through the mass of hot coal" to the ash-pit, from whence it passes into a pipe that connects both ash-pits, and is, therefore, common to both generators. On this horizontal pipe is a vertical branch connected with the back mouthpiece of the through retort, $C^1$, into which it flows. In the mouthpiece of this retort is placed a moveable casting, of which fig. 4 is a plan, that enters some little distance into the retort. It is called the vaporizer, and is sufficiently inclined to cause any fluid, dropped on the end nearest the retort-lid, to flow onward to the end, *q*, that is within the retort. The pipe that delivers the oil enters the mouthpiece close by the pipe conveying the gas, and that portion of the vaporizer, *n*, is so placed as to receive it. From this cross channel, *o*, *o*, *o*, grooves extend to the end of the implement; consequently the oil is supposed to be divided into as many streams as grooves; at any rate, as long as it retains its liquidity. The vapour and gas now travel together the length of this retort to the front, up the pipe, *j*. to the retort, $C_2$, back to the rear mouthpiece of $C_2$. down the pipe, *j*, to the rear end of retort, $C_3$, passing from back to front, up the pipe, *d*, to the hydraulic main, D, and away to the gasholder through pipe E, a permanent and fixed gas.

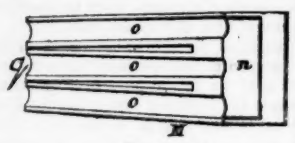


FIG. 4.

The patentee says, "While one generator is being thus used, the other is being heated, and when the first has been run for about an hour, the steam is shut off from it and turned into the second one, the first being replenished with coal, and heated so as to be ready for use by the time the second is exhausted, and thus the operation is rendered continuous." It is claimed for this method that the gas produced by the process is carburetted hydrocarbon oxide, of a specific gravity of 700. It is also asserted by the inventor that the gas requires neither washing nor purifying, being entirely free from sulphur and phosphorus. Notwithstanding this statement, however, we can only say that, as surely as coal contains sulphur, and water hydrogen, so surely will the patentee, by his process, if he does anything, form sulphuretted hydrogen. The carbonic acid that will be left undecomposed is not mentioned, and therefore, perhaps, is not suspected; but it unquestionably will be found whenever the process is put into practical operation.

*(To be continued.)*

## GAS AND ITS USE AS FUEL.

The question of promoting the use of gas as fuel for domestic and trade purposes is one that merits the special attention of all who are engaged in the manufacture and supply of that article. We therefore propose to offer a few suggestions in reference to the subject.

That coal gas possesses all the essential elements of a good and economical fuel is now placed beyond doubt. The experience of the last 30 years has proved its efficiency for almost every domestic purpose in which heat is required, and the variety of contrivances, for utilizing it in trade operations, which were brought together in the recent Exhibitions at Birmingham and South Shields show conclusively that manufacturers are beginning to realize its advantages in meeting other wants than those of the household. The supply of gas for any other use than that of illumination has, however, been treated by Gas Companies in past times too much as a mere incident in their operations, which only under peculiar conditions and circumstances was worthy of consideration. The development of this branch of their business has also been retarded by the bugbear of day pressure, and increased leakage, more labour for Inspectors, and longer columns in complaint-books. These and other objections have been raised by many Companies or their officials, and where decided obstacles like these have not been placed in the way, there has still been, on the part of the majority of Companies, a lukewarmness and want of cordial sympathy with any attempt to promote the use of gas for cooking and heating, so that if any advance has been made in this direction, it has, with few exceptions, been due to the energy and enterprise of private individuals, either as Consumers of gas or as Manufacturers of gas apparatus.

It now, however, seems to be a recognized duty of all Companies or Corporations interested in the sale of gas, to turn their attention to the subject, and as a commercial enterprise the increase in the use of gas in this direction will, after a moment's reflection, be seen to be a matter of the utmost importance.

For several years past the value of gas property has now and then been threatened by the introduction of some new mode of obtaining artificial light—Air Gas, New Gas, Eupion Gas, Petroleum Light Companies, and last, but not least, the Electric Light and Jablochkoff Candle, have all in turn had their effect on gas shares, and not a few timid holders have looked with dismay on what they feared might be the disastrous consequences, if these new luminaries should ever come into public favour. It must, however, be borne in mind that in thus judging of the influence any of the schemes might have on the value of gas investments, reference, in most instances, was only made to it as a source of light. It is true that some of the promoters of water gas have put forward extravagant claims in reference to its use as a source of heat, but a brief consideration of the impracticability of sending out mere non-luminous or heating gas at one part of the day, and carburetted or light-giving gas at night, through the same set of mains, would show that for all practical purposes water gas schemes can only compete with coal gas as lighting agents in the ordinary sense of the term. Such being the case, any means by which coal gas is rendered more valuable for other purposes than that of illumination must place it in a more independent and secure position.

Taking this view, it seems scarcely necessary to point out how largely the profits arising from the manufacture of gas might be increased if the plant necessary for the winter working could be utilized in the summer, or if the daily make of gas could be rendered more uniform throughout the year. In such a case the public would be immensely benefited, because they would be furnished with both light and heat at a cheaper rate; and the proprietors of gas-works would be equally benefited, because their property would be more fully utilized, and more completely secured from the risk of depreciation by the introduction of rival sources of light.

In tracing the history of gas lighting, there are some points which, from their significance, are worthy of attention at the present moment, and among them the fact of the small amount of actual interest displayed by Companies in extending the use of gas. Manufacturers of any article which they desire should be generally adopted exert themselves to show its superiority; they spare no pains to meet and overcome the prejudices of the public, and never rest satisfied until the commodity they are interested in has become an article of universal necessity. But Gas Companies, as a rule, have scarcely ever exhibited this desire to promote the sale of the article in which they deal. Gas was originally introduced to the public as a scientific novelty; its process of manufacture was for many years surrounded with an air of mystery; the very capital invested in its undertakings has always been looked upon as if exposed to more than ordinary risks; and any discussion of the commercial value of gas by its purchasers has been looked upon as an expression of hostility to the vested interests of the Companies who supply it. It is true this exclusiveness is gradually wearing off, and many Companies are beginning to see that they can afford to conciliate their customers without at all jeopardizing their material interests. Notwithstanding the enormous increase in the use of gas which has taken place within the last 20 years, still it may be safely asserted that if the Companies had shown greater interest in the way in which gas was used by their customers the growth of the trade in gas would have been far more rapid than has actually been the case. The apathy exhibited by Companies as to the proper employment of gas by consumers, has been the fruitful source of many of those jealousies and bickerings which have been so prevalent, and which, on many occasions, have led to bitter and expensive legal and parliamentary contests. A few pounds expended in supplying efficient burners, or may-be a day or two in a month of the time of a judicious and intelligent official employed in giving information as to meters and fittings, would, in many instances, have smoothed down hostile demonstrations, and have converted foes into friends. This want of direct interference in securing the profitable employment of gas for lighting purposes by the Companies who make and supply it, has been the mistake of the past; for the future, if they really desire to promote the use of gas for heating, their officers must exert more influence. It is quite certain the ultimate result will amply compensate for any time or trouble expended in directing the attention of manufacturers to what are the essential conditions to be observed in the construction of apparatus where gas is the fuel, and, on the other hand, in instructing consumers as to the kind of cooking or warming stoves best adapted to their circumstances and needs.

The Exhibition at Birmingham will, we believe, have taught some very important practical lessons to those Engineers and Managers who took the pains to carefully examine the articles exhibited. One very special matter was the amount of pressure required in some stoves as compared with others. In more than one instance there was an obvious deficiency of heat, owing to the absurdly small tubes and taps through which the gas was conveyed to the burners; whereas in others the pressure might have been reduced one-third, and yet an ample supply of gas have been obtained. Now as the use of gas for heating purposes will mainly take place when it is to the interests of Companies to have the smallest amount of pressure, it is obviously of the first importance that the manufacturers of stoves and other appliances should be fully alive to the necessity there is so to adjust the burners and fittings as to secure perfect efficiency at the lowest possible pressure. Another important matter connected with the use of gas for either cooking or heating purposes, and one that should receive the especial attention of both the manufacturer and the gas-fitter, is that of securing ample but controllable ventilation, so that the products of combustion, as well as the vapours given off during the process of cooking, may be rapidly and effectively carried away. The want of such provision was a defect more or less observable in nearly every stove exhibited at Birmingham. It is perfectly certain that unless sufficient space be afforded to permit of the escape of all the vitiated air from the stove through a proper channel, a

portion of such air will find its way into the kitchen or other apartment in which the apparatus is placed. It has been this want of proper ventilation in regard to gas-stoves that has made their use objectionable in many instances. No one would think of using coal or coke in a stove or grate in which no chimney was provided to carry off the smoke and other products of combustion, so no one should attempt to fix or use a gas-stove without having taken every precaution to secure ventilation into an existing chimney, or by means of an independent pipe or flue. Not only should precautions be taken to get rid of the products of combustion, but special attention should also be paid to the character of the burner, and the supply of air to it. An objectionable feature in many gas-stoves is that too large a volume of air is allowed to enter a stove, and only a small portion of it brought inti such contact with the gas as to interfere with its perfect combust on. The disagreeable odour given off by some stoves is due to this cause. The uniformity of the size of the holes or jets, and the angle at which the flames are made to incline, are matters of some importance. In order to secure the best results in cooking apparatus, provision should also always be made for a current of air to pass under the dripping-pan. The absence of this precaution frequently causes the fat or dripping to become over-heated or charred, and, as a result, unpleasant smells are produced. Too much care cannot be taken to secure perfect simplicity of parts, and facility for keeping clean, in all gas cooking-stoves. These may appear trivial matters; but just as a bad burner, or a small pipe, may convert good gas into what appears to be bad, so may the want of attention to minor details mar the success of gas as fuel.

The objection frequently urged against the employment of gas for cooking—that it may impregnate the meat or other viands with noxious vapours—has been so ably met by Mr. F. W. Hartley, in his admirable paper on gas-cooking, that it is only necessary here to refer to the matter by saying that the objection is groundless, as no such contamination can by any possibility take place, except through wilful neglect.

The foregoing remarks have had more especial reference to the use of gas for culinary purposes, but they apply equally to its use for heating generally. Full-sized pipes and fittings, low and uniform pressure, and perfect ventilation, are as essential in the heating of baths, in hall, office, or bed-room stoves, or in laundries and workshops, as for the cooking-stove in the kitchen.

Before dismissing the subject, it may be thought desirable to say a word or two upon the use of gas as a motive power. Its application to this purpose seems scarcely to have received the amount of attention in this country that its importance deserves. The almost universal employment of steam generated by the use of coal or solid fuel, has hitherto diverted attention from nearly every other mode of obtaining motive power; but it is a question that merits consideration, whether there are not many processes now carried on in which mechanical power may advantageously be applied, but where the use of steam would be quite impracticable. In such situations the gas-engine meets the difficulty. That such engines can be used with advantage, their extensive employment in Paris, and in other cities on the Continent, is a sufficient proof. One great objection hitherto raised against them in this country has been that they are not so economical as steam-engines of equal power; but, after all, economy is only a relative term. It will be freely admitted that the cost of a pound of coal is less than that of 20 feet of gas; but the time and labour, in making proper use of the former, may eventually make it more expensive. Besides, the one can only be used under very special conditions, whereas the other may be used quite apart from such conditions, and thus meet all the requirements of the case. Under such circumstances the costlier agent is the better, because it accomplishes what the other cannot. It is not, however, in competition with steam that gas-engines can hope to succeed; but in cases where steam is inadmissible. There an engine propelled by gas may be perfectly successful, and on these grounds it is that the attention of the manufacturers of gas should be directed to gas-engines, in order to encourage the use of such machines.

In a future article we propose to offer some remarks on the treatment of residuals, suggested by the exhibition of specimens at Birmingham.

## Correspondence.

*[We do not hold ourselves responsible for the opinions expressed by Correspondents.]*

### AIR AS FUEL.

SIR,—Our furnace, noticed in your issue of the 28th ult., is not quite similar to the "very, very old face" portrayed in Mr. Gore's letter published on the 4th inst.

Whether his recollection is accurate or not is really, however, of little moment. No one surely would think of patenting in principle the introduction of air over the fuel, because, no doubt, it has been done over and over again, not only by the parties he names, but also by others. The real question is, Has it been done exactly in the way we do it, and has the process been published to the world so as to invalidate our patent? We think not, and we think besides that there are accessories connected with our furnace which are essential, and which have not before been employed.

We thank Mr. Gore for the information he furnishes.

*Aldershot, June* 14, 1878. WILSON AND DOUGLAS.

### THE TEMPERATURE OF GAS IN ASCENSION-PIPES.

SIR,—In reply to Mr. Newbigging, I may say that my letter in your issue of June 4 was written mainly to combat his suggestion that Mr. R. O. Paterson had not accurately tested the heat of gas in the ascension-pipes, as the following extract from his letter of the 14th of March will show:—"If he (Mr. R. O. Paterson) will pursue the subject further, he will probably come to the conclusion that the temperature he found so near to the mouthpiece was not that of the issuing gas, but the heat from the retort, or the heat transmitted by conduction to the stand-pipe." In his letter of the 11th of June, Mr. Newbigging charges me with coolly ignoring his letter of the 28th of May, detailing experiments made by him on this subject, in which he goes on to say "that the high temperatures which Mr. R. O. Paterson found in the ascension-pipes were not those of gas at all, but were chiefly due to the volatile tarry matter in suspension therein."

Compare the opinion here last expressed, as to the source of heat, with that given by Mr. Newbigging in his letter of the 14th of March, and perhaps you will agree with me that he is as great an adept as myself at coolly ignoring letters—even his own.

T. A. COLLINGE, Analyst.

*Rochdale Corporation Gas-Works, June* 15, 1878.

### REVIVIFICATION OF SPENT LIME.

SIR,—It was with not a little surprise that I read the article under the above heading in Part 19 of your "Treatise on Coal Gas," issued this month. My process is therein represented to consist in moulding the spent lime, containing all impurities, into bricks before recalcination, and that, therefore, the sulphur is not only commercially lost, but largely fixed in the process of burning, and so rendering the lime soon valueless by converting it into the form of sulphate.

Such a statement is at variance with facts, and is calculated to prejudice the mind of the reader against the process, and appearing as it does in a valuable standard work, it is all the more unfortunate.

The moulding of the lime into bricks was once tried only by way of experiment some five years ago, and found objectionable.

With regard to the sulphur, my process provides for its effectual removal from the lime and absorption into oxide of iron, and that chiefly while in the purifiers, by means of the products of combustion, $CO_2$, from the retort furnaces or the lime chambers, or from both. Any remaining sulphur is removed by the carbonic acid liberated from the lime in the highly-heated recalcining chambers passing over, and in contact with, the foul lime in the upper and colder, or desulphuretting, chamber. When oxide of iron is employed along with lime, the purifiers may be so worked as to obtain the lime with very little sulphur, and any that may remain is removed in the desulphuretting chamber referred to.

And as regards the durability of the lime, it will be sufficient to state that after 70 recalcinations effected at one-half the original cost of lime, it is found to contain only 2½ per cent. of sulphur.

*Paisley Gas-Works, June* 14, 1878. GEO. R. HISLOP.

### SEWAGE GAS.

SIR,—As Mr. Stephan's process of making gas from sewage appears to be exciting some little interest just now, I venture to send you the results of some experiments which I made on the Wrexham sewage sludge on Dec. 6, 1877. The experimental retorts at the Rochdale Gas-Works were charged with 4 cwts. at a time—six-hour charges—the retorts being worked at a temperature of 1000° Fahr. by Siemens's pyrometer. The reason why I worked at so low a temperature is that I was desirous of ascertaining the amount of ammoniacal liquor which could be obtained, as the sludge contained nitrogen equal to ammonia 2·1 per cent. The following was the result of my experiments:—

| | |
|---|---|
| Moisture before putting into retorts | 9·14 |
| Purified gas, per ton | 46·69 cubic feet. |
| Unpurified gas, per ton | 56·96 " |

*Analysis of Unpurified Gas.*

| | |
|---|---|
| Carbonic acid | 19·50 per cent. by vol. |
| Sulphuretted hydrogen | 2·50 " " |
| (Remaining portion chiefly carbonic oxide and hydrogen.) | |
| Residue from retorts | 11·75 cwts. per ton. |
| 65 gallons of ammoniacal liquor, containing | 4·85 per ct. of ammon. |

*Analysis of Residue from Retorts.*

| | |
|---|---|
| Carbon | 15·31 |
| Insoluble silicious matter | 45·62 |
| Oxide of iron and alumina | 14·89 |
| Carbonate of lime | 15·91 |
| Phosphate of lime | 3·41 |
| Alkaline salts, including magnesia | 4·86 |
| Total | 100·00 |

If you will multiply the carbon in the residue from the retorts by three, and divide the other bodies present in the analysis by two, you will have a rough approximation to the composition of the sludge prior to its being put into the retorts. I may just say that I did not contemplate substituting a gas made from sewage sludge for coal gas; but I would explain that dried sludge has a theoretical value of about 30s. per ton—*i.e.*, nitrogen equal to 2 per cent. of ammonia at 15s. per unit—but as the nitrogen is in an insoluble state, and is very slow in its action on the land as a fertilizer, the sludge is not in request by farmers, and, in fact, by its excessive accumulation it has become such a nuisance that at Birmingham, for instance, they have been compelled to dig it into the land to get rid of it. According to these figures, the theoretical value of the products from 100 tons of dried sludge ought to be about £80; that is to say, after the ammoniacal liquor has been made into sulphate of ammonia. The question I am now engaged upon is this: How much fuel would be required to carbonize and dry the sludge, using, of course, all the waste heat for drying the sludge prior to its being put into the retorts. The gas from the sludge could also be used to heat the retorts, or a portion could be carburetted and used on the works for lighting purposes. I must add that the gas burns with a non-luminous blue flame. T. A. COLLINGE, Analyst.

*Rochdale Corporation Gas-Works, June* 15, 1878.

# Parliamentary Intelligence.

## HOUSE OF COMMONS.

THURSDAY, JUNE 13.

Bangor Local Board Bill.—Lords amendments agreed to.
Newry Gas Bill (Lords),—as amended, considered.

FRIDAY, JUNE 14.

Lichfield Gas Bill (Lords), Trowbridge Water Bill (Lords),—reported with amendments.

# Legal Intelligence.

## WIMBORNE COUNTY COURT.

TUESDAY, JUNE 11.

(*Before Mr.* T. E. P. LEFROY, *Judge.*)

BLAKE V. THE WIMBORNE GAS COMPANY.

In this case the plaintiff, Mr. R. S. Blake, veterinary surgeon, sued the Wimborne Gas Company for £10 for injury caused to his horse and carriage on the 10th of April, in the public road through the Corn Market at Wimborne, in consequence of the defective state of repair of the road, caused by the negligence or want of proper care of the defendants, or their surveyor or servants, in the laying of gas-pipes.

Mr. H. T. TREVANION appeared for the plaintiff; Mr. H. W. DICKINSON for the defendants.

Mr. DICKINSON took a preliminary, and, as he thought, a fatal objection to the plaintiff's case. In the first place, he submitted that the action was not maintainable, inasmuch as it was for injury caused by the defective state of repair of a highway, and such action could not be brought by the plaintiff as one of the public. In support of this he cited the case of *Gibson v. The Preston Corporation*, in which it was held no action could arise in the case of non-repair of a highway against the Corporation, who were only responsible to the Crown.

Mr. TREVANION said the case quoted by Mr. Dickinson was very different from the present. The plaintiff claimed damages against the Gas Company, who, with the sanction or permission of the Authorities, had opened up a trench to lay down their gas-pipes, and in filling in the same had done it so negligently that his client, who was driving over the spot, met with an accident through the ground caving in, whereby his trap was broken, and his horse sustained considerable damage.

The JUDGE said he was most decidedly of opinion that if such damage was proved the Gas Company were liable.

Mr. DICKINSON said he had another still stronger objection—viz., that the highway was not vested in the defendants, and that the defendants were not a corporation, nor were they acting in the exercise of statutory powers.

Mr. TREVANION: I grant you that; if this was a case against the Highway Board we should have had to proceed by indictment, but it is not so.

The JUDGE: It would be a monstrous injustice if, when a serious accident occurs through the negligence of men employed to lay down gas-pipes not properly filling up the excavations they have made, the party could not recover damages. In both law and equity I am bound to decide against those objections, so the case must go on.

Mr. DICKINSON said he would hand in a written statement of his objections to the action, viz:—"1. This action is not maintainable, inasmuch as it is an action for injury caused by the defective state and repair of a highway, and such a claim cannot be brought by the plaintiff as one of the public. 2. That the said highway is not vested in the said defendants, and that the said defendants are not a corporation, nor were they acting in the exercise of statutory powers."

Mr. TREVANION then opened the case, and having stated the facts, he proceeded to deal with the objections raised by the learned Counsel on the other side; but

The JUDGE said this was unnecessary, as both in law and common sense, he considered the Gas Company were responsible.

Mr. *Richard Stone Blake*, the plaintiff, was then called and examined. He said that he was a veterinary surgeon, and on the 10th of April last was driving a horse and trap, accompanied by a pupil. He drove through Cook Row, near the Corn Market. The plan produced shewed the street, and at a point marked B the accident took place. The wheel of his trap sank in the soil up to the axle, and his horse's fore legs went in up to the chest. The young man endeavoured to get out, but he was thrown out. On getting the horse out it struggled a good deal, and had eleven or twelve bleeding wounds on its legs; indeed, they were covered with blood.

By the JUDGE: The place was apparently entirely covered over, and looked like the hard road. His horse was walking at the time; had he been driving fast most likely he would have been killed. He estimated the damage at £10. The trap cost 10s. to repair.

Cross-examined by Mr. DICKINSON: The horse was much shaken. Though aged, it was valuable to him. It was blemished permanently by the accident, especially the fetlock. There were eleven or twelve bleeding wounds on it. It was difficult to estimate its real worth without it was offered for sale; but he did not believe, if so offered, it would fetch £20. He had offered to settle the matter by referring it to two independent persons. He knew gas-pipes had been laid. He could not say whether or not there was a sewer near. The place appeared as perfect as the high road. The wheel sank into the soil, and when got out the place filled up like a bog. The accident occurred about half-past ten in the morning. There had been heavy rain the night before. Had used the horse since, but it did not go so well, and he frequently went by train to spare it. It was 18 or 19 years old; certainly not over 20. The blemishes were scars on the legs. It being a pure white horse, the blemishes were more perceptible. He could not replace it for his work under £50. He could not say what it would fetch if offered in the market.

Mr. *E. W. Baker*, said that he was a pupil of the plaintiff, and was in company with Mr. Blake on the day in question. There was nothing to show any danger. The road appeared to have been filled up in the ordinary manner. Finding the wheels were gradually sinking, he stepped out of the trap; the wheel was then embedded up to the axle. The horse also sank down almost up to its belly. There were men at the top of the street, but they did not say anything.

Mr. *Wilson W. Beale*, corn dealer, stated on the day named Mr. Blake drove up to his house, and he saw the horse, which appeared to have been much shaken. He told plaintiff if the horse was his he should sue the Company for £15, and he considered £10 a fair sum as damages.

Cross-examined by Mr. DICKINSON, witness said he had never tried the horse by riding it, but he had examined it over. He would have given the plaintiff £35 for the horse before the accident, but now he would not have it at any price.

Mr. *Richard Polden*, District Surveyor of Highways, who had been subpœnaed as a witness for the defence, was called by Mr. TREVANION. He said he had seen the place where the accident occurred. Both before and after the accident he had cautioned the Gas Company's men as to the careless way the work was done, telling them there was sure to be another accident. There had been one before. The accident did not occur through any defect in the drain. He had complained several times to the Gas Company of the work being badly done, and, on the day before the accident, he had spoken to the men about it. The Gas Company applied to the Highway Board for permission to open the ground, and, when the man was about to commence the work, he gave him (witness) notice. Instead of ramming in the soil, they put in a lot of soft earth. He reported the condition of the road on April 12 to the Highway Board.

By the JUDGE: He had previously reported the way in which the Gas Company's men left the roads on the 7th of December, just before an accident near the station.

Mr. *S. V. Thomas*, Relieving Officer and Sanitary Inspector, said he was acquainted with the position of the parish drains in the town. The plan produced, made by Mr. Fletcher, the county surveyor, showed the drains in the market place. On the day of the accident he was sent for to see a drain near where the accident happened. The gas people had broken it, and whilst there the side of the drain fell out. The drain was exposed by the Gas Company's men. They asked him if they could carry their pipes under the drain, and he told them they could, and a regular builder afterwards made the drain. The drain had nothing to do with the accident complained of.

Mr. DICKINSON addressed the Court for the defendants, and contended that his clients were not liable, and even if they were the amount claimed was excessive. The value set upon the horse was ideal; the horse was nearly 20 years of age, and yet it had been repeately driven since, and was used on the same day after the accident. He (Mr. Dickinson) asked his Honour to note the terms of his legal objection, and intimated that if the judgment was against him he should appeal.

The JUDGE said in his opinion, from the evidence, it was clear the injury was occasioned by the negligence of the Gas Company in improperly and imperfectly filling in the trench they had been permitted to open on the highway, and the damages claimed by the plaintiff were not excessive. He should give a verdict for plaintiff, with costs.

Mr. DICKINSON said, as the damages were under £20, he must ask leave to appeal.

The JUDGE said he should refuse to give leave, as he believed substantial justice had been done by his decision.

# Miscellaneous News.

## METROPOLIS GAS SUPPLY.

Report by Dr. Stevenson on the gas supplied by The Gaslight and Coke Company to the Vestry of St. Pancras, during last month:—Maximum light estimated by sperm candles, according to the Act—18·0. Minimum light, sperm candles—16·5. Average light, sperm candles—17·3. Traces of ammonia, indicated by turmeric test paper—Traces on all occasions of examination. Traces of sulphuretted hydrogen, indicated by lead test paper—None on any occasion of examination. Sulphur, 11·6 grains per 100 cubic feet.

## METROPOLIS WATER SUPPLY.

Dr. Frankland reports, as the result of his analyses of the waters supplied to the Metropolis and some of its suburbs during May, that taking the average amount of organic impurity in a given volume of the Kent Company's water during the nine years ending December, 1876, to represent unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health was:—Kent 0·85, Colne Valley 1·1, Tottenham 1·3, New River 2·9, East London 3·9, Lambeth 3·9, Chelsea 4·0, Grand Junction 4·5, West Middlesex 4·8, and Southwark 4·8. The Thames was in flood at the beginning of the month, and the water delivered by the five Companies drawing from this source was unfit for dietetic purposes, being much polluted with organic matter, some of which was of animal origin. The Grand Junction Company supplied turbid, and the Southwark Company slightly turbid water, and the suspended matter in both these waters contained moving organisms. The remaining Thames Companies delivered efficiently filtered water. The Lea was also in flood, and the water of the New River and East London Companies suffered deterioration in consequence. Nevertheless, this water was of much better quality than that obtained from the Thames. The deep well water delivered by the Kent and Colne Valley Companies, and by the Tottenham Local Board of Health, was unaffected by the rains; it was bright, wholesome, palatable, and of its usual excellent quality. Seen through a stratum 2 feet deep, the water supplied by the Kent and Colne Valley Companies, and by the Tottenham Local Board, was clear and colourless; the New River and East London Companies water was clear and almost colourless; the Chelsea Company's water, clear and very pale yellow; the West Middlesex and Lambeth Companies water, clear and pale yellow; that delivered by the Southwark Company was slightly turbid and pale yellow; and that by the Grand Junction Company, turbid and yellowish brown.

*Results of Analysis expressed in Parts per* 100,000.

| Companies or Local Authorities. | Total Solid Matters. | Organic Carbon. | Organic Nitrogen. | Ammonia. | Nitrogen, as Nitrates and Nitrites. | Total combined Nitrogen. | Chlorine. | Total Hardness. |
|---|---|---|---|---|---|---|---|---|
| *Inner Circle.* | | | | | | | | |
| Thames— | | | | | | | | |
| Chelsea | 27·50 | ·208 | ·029 | 0 | ·164 | ·193 | 1·6 | 19·7 |
| West Middlesex | 29·24 | ·229 | ·049 | 0 | ·171 | ·220 | 1·5 | 20·5 |
| Southwark | 29·44 | ·227 | ·056 | 0 | ·178 | ·234 | 1·6 | 20·0 |
| Grand Junction | 30·80 | ·226 | ·040 | 0 | ·180 | ·220 | 1·6 | 20·0 |
| Lambeth | 30·68 | ·183 | ·051 | 0 | ·215 | ·266 | 1·6 | 20·0 |
| Other Sources— | | | | | | | | |
| New River | 26·78 | ·142 | ·030 | 0 | ·212 | ·242 | 1·55 | 19·1 |
| East London | 29·94 | ·189 | ·042 | 0 | ·170 | ·212 | 1·85 | 20·9 |
| Kent | 44·70 | ·031 | ·019 | 0 | ·455 | ·474 | 2·45 | 28·1 |
| *Outer Circle.* | | | | | | | | |
| Colne Valley | 14·26 | ·040 | ·024 | 0 | ·325 | ·349 | 1·4 | 6·7 |
| Tottenham Local Board | 49·90 | ·043 | ·020 | 0 | ·605 | ·625 | 3·6 | 27·9 |
| " " | 48·96 | ·069 | — | ·002 | ·525 | — | 3·5 | 24·3 |
| Corporation of Birmingham* | 21·46 | ·130 | ·044 | ·005 | ·220 | ·268 | 1·9 | 14·0 |
| Corporation of Glasgow+ | 2·30 | ·104 | ·030 | 0 | ·006 | ·019 | 0·55 | 0·79 |

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
+ Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

*Note.*—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

The Registrar-General publishes the following returns of the average daily quantity of water supplied by the London Water Companies during the month of May, 1878. According to these, 125,453,161 gallons, or 569,991 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight) were supplied daily; or 230·5 gallons (104·7 decalitres), rather more than a *ton* by weight, to each house, and 32·5 gallons (14·8 decalitres) to each person, against 31·1 gallons in May, 1877.

| Companies. | Number of Houses, &c., supplied in May, 1877. | Number of Houses, &c., supplied in May, 1878. | Aver. Daily Supply of Water in Gallons* during May, 1877. | Aver. Daily Supply of Water in Gallons* during May, 1878. |
|---|---|---|---|---|
| Total supply | 532,613 | 544,217 | 117,591,830 | 125,453,161 |
| From Thames | 250,034 | 257,295 | 59,218,609 | 62,788,068 |
| „ Lea and other Sources | 282,579 | 286,922 | 58,373,221 | 62,665,093 |
| **Thames.** | | | | |
| Chelsea | 28,741 | 29,014 | 7,560,660 | 8,728,200 |
| West Middlesex | 49,162 | 50,677 | 10,334,504 | 10,187,794 |
| Southwark and Vauxhall | 78,000 | 80,431 | 17,750,000 | 18,350,000 |
| Grand Junction | 37,683 | 38,462 | 10,698,605 | 12,333,974 |
| Lambeth | 56,448 | 58,711 | 12,874,900 | 13,188,100 |
| **Lea and other Sources.** | | | | |
| New River | 125,180 | 126,629 | 25,973,000 | 28,305,000 |
| East London | 111,967 | 115,143 | 25,403,400 | 26,400,000 |
| Kent | 45,432 | 45,150 | 6,996,821 | 7,960,093 |

* Including that for manufactures and for various purposes other than for domestic consumption.

*Note.*—The return for May, 1878, as compared with that for the corresponding month of 1877, shows an increase of 11,604 houses, and of 7,861,331 gallons of water supplied daily.

## PARIS UNIVERSAL INTERNATIONAL EXHIBITION, 1878.

### British Exhibitors.

The following, taken from the Official Catalogue, is a List of the British Exhibitors of Gas, Water, and Sanitary Appliances:—

Group III.—*Class 27.—Apparatus and Processes for Heating and Lighting.*

Abrahams, A., Elgin Road, London.—Revolving Advertising Lamp.

Leoni, S., and Co., St. Paul Street, London.—Gas Oven for roasting or baking. Gas Hot Plate. Gas Kitchener. Patent Multiple Gas Boiler, with Steamer, &c. Gas Hot Closet. The Lady's Summer Kitchener, and other small gas apparatus for domestic purposes.

Longden and Co., Phœnix Foundry, Sheffield.—Gaselier in the English style of the seventeenth century. Tiled Stove, with Gas Heating and Reflecting Apparatus.

Paris, J., Stratford, Essex.—Portable Ironing Table, with Apparatus for Forcing Air, and also for making the gas required for Heating, adapted for cooking, brazing, soldering, glass blowing, chemical and general experiments, to be used with ordinary gas, or with the gas made within itself.

Scanlan, Jun., and Co., Walsall.—Apparatus for Heating and Cooking by Gas (Leoni's Patent).

Wright, Jno., and Co., Essex Works, Birmingham.—Gas Cooking Apparatus and Boiling Stoves in various sizes. An Oven for Gas Cooking Apparatus. A Bath with Gas Cooking Apparatus. Gas Heating Stoves, "Brilliant," "Imperial," and Ventilating, of various sizes. Stannate Bronze-metal Gas Brackets and Chandeliers. Cases of Stockes and Dies for Engineers and Gas-Fitters, "Eclipse" Gas-Making Apparatus.

Group V.—*Class 43.—Mining Industries, Raw and Manufactured Products.*

Cambrian Patent Fuel Company Limited, Cardiff.—"Cambrian" Patent Fuel, an agglomeration of the best Welsh "Smokeless" Steam Coal and Coal Tar Pitch, pulverized and subjected to a dry heat process in patented machinery, to eliminate all traces of sulphur and other deleterious particles incorporated with coal tar pitch, and subjected to a pressure equal to 70 tons per block.

Harper and Moores, Stourbridge.—Fire Clays in their raw state, and refractory materials.

Houghton, W. D., Warrington.—Brass Pinion Wire for Gas and Water Meters.

Londonderry, Marquess of.—Londonderry Gas Coal for the Manufacture of Gas and Coke.

Marshall, R., Glasgow.—Sample of rich Cannel or Gas Coal, called the "Marquis of Lothian's New Battle," yielding 12,573 cubic feet of 33·8 candle gas per ton, and 1046 lbs. of excellent coke, containing only 3·9 per cent. of ash per ton. Sample of rich Cannel or Gas Coal, named "Old Wemyss," yielding 13,320 cubic feet of 32·62-candle gas, and 1035 lbs. of coke, containing 26·50 per cent. of ash per ton.

Mason and Co., Leith.—Cannel Gas Coal for manufacturing Gas in large volume of great purity and high illuminating power.

Palmer, Morgan, and Co., Cardiff.—Gas Coal.

South Derwent Colliery Company, Newcastle-on-Tyne.—A block of West Pelaw Main Gas Coal. A lot of above Coal screened as delivered to Gas Companies. Samples of Coke as made from the same Coal at the Paris Gas Company's works, and at the Colliery coke-ovens.

Thriscutt and Bale, St. Austell.—China Clay or Kaolin in its raw or rough state, prepared for shipment, fired, and manufactured.

Walker, James, Leeds.—Samples of Kaolin and its productions.

Wigan Coal and Iron Company, Limited, Wigan.—Specimens of Arley Coal used principally for gas-making and household purposes. Specimens of Cannel used for gas-making and producing a large quantity of gas of a high illuminating power.

Group V.—*Class 47.—Chemical and Pharmaceutical Products.*

Brooke, Simpson, and Spiller, Hackney Wick.—Series of Dyes, Colouring Matters, and other products derived from Coal Tar.

Fayolle, G., Mark Lane, London.—New Fast Analine Dyes, produced by a new process.

Griffiths, Fletcher, and Berdoe, Liverpool.—"Griffiths's Patent White," a non-poisonous substance of snowlike whiteness, of permanent colour, and totally unaffected by sulphuretted hydrogen gas or atmospheric influence.

Levinstein, L. J., and Sons, London Bridge.—Analine Dyes, and raw materials for their manufacture.

Lowe, C., and Co., Manchester.—Products from Coal Tar, Carbolic Acid, and its derivatives.

Oakbank Oil Company, Limited, Glasgow.—Specimens of Shale, and of the products obtained from it by distillation and refining, Kerosine, Paraffin Scale, Sulphate of Ammonia, &c.

Simpsons, Payne, and Co., Millwall.—Sulphate of Ammonia, &c.

Wilson and Co., Mile End.—Analine Dyes, &c.

Young's Paraffin Light and Mineral Oil Company, Limited, Glasgow.—Bituminous Shale and Coal. Crude and Partially Purified Oils and Paraffin from Shale. Sulphate of Ammonia and Shale. Naphtha, &c.

Group VI.—*Class 50.—Apparatus and Processes of the Art of Mining and Metallurgy.*

Brakell, C., Westminster Chambers, London.—Gas Exhausters, Water and Sewage Pumps, &c.

Diamond Rock Boring Company, London.—Sample Cores obtained by the Diamond Rock Borers. Crowns showing setting of Diamonds.

Protector Lamp and Lighting Company, Limited, Manchester.—Safety Lamps and Lighting Apparatus for Collieries. Model of Patent Gas-Making Apparatus.

Saville Street Foundry Company, Limited, Sheffield.—Patent Rotary Pump, &c.

Taylor, H. E., Newgate Street, London.—A Chester Pump for Forcing Water, applicable to Mines, Collieries, Water-Works, &c.

Group VI.—*Class 53.—Apparatus used in Chemistry, Pharmacy, and Tanning.*

(Processes and Apparatus used in Gas-Works.)

Cowan, W. and B., London, Manchester, and Edinburgh.—Warner and Cowan's Self-Regulating Gas-Meter, and three cylinders to show construction.

General Heat and Light Company, Limited, Battersea.—Apparatus for Generating Heating Gas at a cost of about 4d. per 1000 cubic feet. This gas is chiefly used for cooking and heating purposes, and for singeing yarns or threads in spinning-mills. It is also very good as a lighting gas if carburetted with petroleum spirit.

Gibbons, B., Jun., Dibdale Fire-Clay Works, Lower Gornal.—A round Retort, hand made (old process). A D-Retort, machine made (new patent process). Sections of machine-made retorts in the "rough," and without being finished. Burs, Bricks, Tiles, &c. Fire-clay, raw and unprepared, and burned, Fine Fire-Clay Cement, Fire-Bricks, Blocks, Models, &c. Fire-Clay, natural and prepared.

Mackrill, Thacker, and Co., Aylesbury.—Models of Gas-Works.

Sugg, W., Westminster.—Gas Apparatus, Illuminating Power Meter, and Kirkham and Sugg's Improved Jet Photometer, both showing illuminating power of gas. Experimental Meter with central dial, showing the consumption of gas per hour. Patent Dry Gasholder, with flexible joints. Patent Street Governor, also another with glass cover. Patent Double Dry Consumer's Governor, also another with glass cover, to show action of diaphragms while in actual use. Various Gas Burners, Argand and others.

The Sun Auto-Pneumatic Lighting and Heating Company, Southwark Street, London.—A Machine for making Gas from Gasoline without coal or heat, specially adapted for lighting country houses, churches, &c., where coal gas is not obtainable. A Street-Lamp, which makes Gas as it burns, the light from which is as cheap as coal gas at 3s. per 1000 cubic feet. An Oil Lamp Burner and Gas Burner. The particular features in these are a series of vertical diaphragms in the central air space, by which the air currents are regulated.

Tice, W., Southport.—Tice's Improved Dry Gas Regulator, for economizing and equalizing the pressure of gas. Tice's Radiating Street-Lamp Regulator, to supply any given number of cubic feet per hour.

Wright, Jno., and Co., Essex Works, Birmingham.—"Eclipse" Gas-Making Apparatus, for private houses, railway stations, &c.

Wright, W., Sheffield.—A Patent Atmospheric Gas-Making Apparatus. An Atmospheric Gas-Stove. A Common Coal Gas-Stove.

Group VI.—*Class 54.—Machines and Apparatus in General.*

Adair and Co., Liverpool.—Pumps, Fire-Engines, &c.

Alley and Maclellan, Glasgow.—Patent Sluice Valve for Water-Works, having four gun-metal faces and screw. Patent "Clearway" Ball Hydrant, having internal cup shield to prevent the ball being forced into the inlet from the main. Patent Air Valve with cup shield, to prevent the rush of air lifting the ball, and preventing further outlet from the main. Patent Water-Meter for household and general use. A Pressure Transmitting Meter, having a continual flow. Alley's Patent Bearing Feeler, an instrument for giving warning by sound or otherwise when bearings of machinery heat.

Appleby Brothers, Emerson Street, London.—Steam Cranes, Steam Lifts, Winding and Pumping Engine, Vertical Steam Pumps, &c., &c.

Bernays, J., Newgate Street, London.—Centrifugal Pump, &c.

Blundell, G. T. and J. W., West India Road, London.—Waterwitch Pump. Duplex Fire-Engine and Pump. Self-acting Lavatory. Double and Single Valve Water-Closets. Under Water-line Water Closet, &c.

Brown, B. and J., and Co., Charlotte Street, Blackfriars, London.—Gas-Meters, Gas-Lamps, &c.

Deurance, J., and Co., Great Dover Street, London.—Cocks, Water-Gauges, Valves, &c.

Gwynne and Co., Essex Works, Strand, London.—Combined Centrifugal Pumping Engine, with Air Charging Pump complete, for raising wrecks, salvage purposes, surface condensers, drainage and irrigation. Combined Gas Exhauster and Steam Engine, for extracting gas from retorts, and passing it through the purifiers, with regulator and gas-valves. A small size Gas Exhauster as above. Three ordinary Centrifugal Pumps, with all the latest improvements; the internal disc and shaft can be taken out and replaced in a few minutes. Two Retort Lids for sealing the mouths of gas retorts simultaneously. A small Turbine Water Wheel.

Gwynne, J. and H., Hammersmith.—One 5-inch Vertical Centrifugal Pumping Engine. One 9-inch Centrifugal Pump, with horizontal suction and vertical discharge, with one standard to bed plate. One 7-inch Pump, with two standards, and fast and loose pulleys. One 6-inch Pump on carriage, and one 12-inch Pump. Case containing Model (one eighth of full size) of pair of 54-inch Direct Acting Centrifugal Pumping Engines, &c., &c.

Haynes, T., and Sons, Edgware Road, London.—Pumps, Hydrants, &c.

Hydraulic Engineering Company, Limited, Chester.—Pumps, Hydraulic Engines, &c.

Lawrence and Porter, Westminster.—Portable Centrifugal Steam Pumping Machinery.

Le Grand and Sutcliff, Bunhill Row, London.—Model of Norton's Abyssinian Tube Well and Driving Apparatus, &c., &c.

Loewenthal, L., Harrow Road, London.—New Patent Gas Fire Engine, and Apparatus for instantaneous extinction of fire in buildings, ships, mines, &c., &c., and for preventing spontaneous or other combustion, explosions, or over-heat, by the use of patent astral gas with or without water. Respirators, Syphons, Drinking Fountains, &c.

M'Kenzie, T., and Sons, Limited, Holborn Viaduct.—Leffel's Patent Double Turbine Water-Wheel, 23 inches diameter, for driving all sorts of machinery where water power is available; with a 30 feet fall, will give 55-horse power.

MARTINEAU AND SMITH, Birmingham.—Cocks, Valves, and Fittings for Steam-Engines, Water, &c.
MAY AND MOUNTAIN, Birmingham.—Hydrants and Stand Pipes, &c.
MERRYWEATHER AND SONS, London.—Steam Fire-Engines, Hand Pumps, India Well Pump, Lift and Force Pumps, Compound Stationary Steam-Pump, Hydrants, Stand Pipes, Valves, Water-Meters, &c.
MÜLLER, H. L., Birmingham.—Alpha Patent Portable Gas-Making Apparatus, to make gas from gasoline.
PULSOMETER ENGINEERING COMPANY, LIMITED, London.—A selection of Pulsometer Steam Pumps, Water-Meters, &c.
RUSSELL, JNO., AND Co., LIMITED, Walsall.—Gas and Steam Tubes, Bends, Tees, Elbows, and Flanges. Brass Gas Cocks and Swivels, &c., &c.
SCANLAN, JUN., AND Co., Walsall.—Steam Cocks, Water Cocks, Pumps, &c.
SHAND, MASON, AND Co., London.—Patent Steam Fire-Engine, Hydrants, Hose Reel, &c., &c.
SIMON, L., AND SON, Nottingham.—Gas-Engines, &c.
STANNAH, J., London.—Patent Pendulum Donkey Pumps, &c.
TANGYE BROTHERS, Birmingham.—"Special" Direct Acting Pumps, "Special" Direct Acting Fire-Engines, &c., &c.
TAYLOR AND Co., Holloway.—Patent Cast-Iron Pipe or Column Cutter for cutting a continuous length of pipe in a trench or building without removal.
TURNER, F. W., St. Albans.—Portable Pumps, Hydraulic Motors or Water Pressure Engines, for driving any description of machinery by town water pressure or other source of supply. Pumps for domestic purposes.
TYLER (HAYWARD) AND Co., London and Luton.—Model of Cope and Maxwell's Patent Direct Acting Pumping Engines, Donkey Pumps, Hot Air Engines, &c.
WHITLEY, J. R., Didsbury.—Stop Valves for Steam and Water Pipes and Mains, &c., &c.
WILSON, A., AND Co., Vauxhall.—Direct Acting Steam Pumps, &c.

GROUP VI.—*Class* 61.—*Machines, &c., used in various Works.*

KENNEDY PATENT WATER-METER COMPANY, LIMITED, Kilmarnock.—A Postive Water Meter, which actually measures the quantity of water passing through it.

GROUP VI.—*Class* 66.—*Apparatus and Processess of Civil Engineering, &c.*

ABERNANT IRON WORKS AND COLLIERY COMPANY, Glyn-Neath.—Dinas Silica Fire Bricks, Clay, Cement, and Sand.
BROOKE, E., AND SONS, Huddersfield.—Sanitary Tubes, Fire Bricks, and Quarries, Sewer Ventilators, Gas Retorts, &c.
CHEAVIN, G., Boston.—Filters, &c.
CLIFF, JOSEPH, AND SONS, Wortley.—Series of Fire Clay Retorts, made by their own patent machine. Drain Pipes of all sizes and kinds. Traps, &c. Patterns of Fire Bricks and Lamps of all kinds, &c.
DOULTON, H., AND Co., Lambeth.—Sanitary Stone Ware, &c.
DOULTON AND WATTS, Lambeth.—Stone Ware used in the manufacture of chemicals, &c.
DUNNACHIE J., Glasgow.—Fire Bricks as used in the Siemens' furnace. Samples of Glenboig Star Fire Clay. Hislop's built Gas Retort, &c.
GLENBOIG FIRE CLAY COMPANY, Glasgow.—Gas Retorts, Sewage and Water Pipes, &c.
HARPER AND MOORES, Stourbridge.—Fire Bricks, Fire Clays, Crucibles, Gas Retorts, Melting Pots, &c.
HARRISON, G. K., Stourbridge.—Stourbridge Fire Clays in natural state, as raised from their mines. Specimens of the same after having been subjected to intense heat, showing no contraction. Stourbridge Fire Bricks. Gas Retorts in one piece, and Bricks for making same in segments,
HOLLICK AND Co., Greenwich.—Portland Cement in powder for hydraulic works, &c.
HOWORTH, J., Farnworth.—Revolving Archimedian Screw Ventilators, self-acting by wind, or driven by motive power.
JENNINGS, G., Lambeth.—Sanitary Appliances.
KING BROTHERS, Stourbridge.—Specimens of best Fire Clays produced from their mines, also specimens of the same Clay subjected to intense heat, to show how little it contracts or is affected by it. Specimens of Fire Bricks and Gas Retorts, &c.
PLYMOUTH FIRE CLAY COMPANY, Gunnislake.—Fire Bricks, Fire Clay, &c.
RAMSAY, G. H., Newcastle-on-Tyne.—Fire Clay, Retorts, Fire Bricks, Sanitary Pipes, Coke, Garesfield Coke, Cannel Coal, Gas Coal, Coking Coal.
SCOTT'S SEWAGE COMPANY., LIMITED, South Kensington.—Portland and other Cements from Water Carriage Sewage, Ammonic Fimus Manures made from dry excreta.
SILICATED CARBON FILTER COMPANY, Battersea.—Water Filters.
SMEATON AND SONS, Wych Street, London.—Baths, Urinals, Water Waste Preventers, &c.
STIFF, J., AND SONS, Lambeth.—Drain Pipes, Sewer Traps, Water Filters, &c., &c.
STONE, J., AND Co., Deptford.—Waste Preventing Valves and Taps, &c., Hydrants, Stand Posts, Sluice Valves, &c.
TYLER, J., AND SONS, Newgate Street, London.—Patent Water Meter and Fittings. Waste Preventing and Sanitary Apparatus.
WHITEHEAD, J., AND Co., Preston.—A Direct Action Steam Machine for the Manufacture of Earthenware Sewage Pipes, Fire Clay Gas Retorts, and Pipes for the Flow of Chemicals, &c.
WHITE, SUTCLIFFE, AND SON, Halifax.—Water Taps, Bath and Lavatory Taps, Steam Valve Taps, &c.

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BOLTON CORPORATION GAS DEPARTMENT.—The writer of "Town Talk," in the *Bolton Weekly Guardian*, says: "The Bolton Corporation appear to me to be a most unfortunate body. They—I speak of the ruling majority—seem to be always in hot water or at loggerheads with their servants. Sometimes they discharge their servants, and sometimes the servants discharge them. There are changes without end, changes startling and stupendous. I hear recently that a servant of high standing in Corporation favour has had some cause given him to think of sending in his resignation. The Gas Committee—though the press has been forbidden to publish it—and the Corporation official, don't appear to have hit the nail of happy accord altogether on the head, and it is rumoured that the Manager and the Committee are about to part company. Whether Mr. Veevers is leaving Bolton or not, or is shifting his quarters to more congenial latitudes, I don't know, but it has oozed out recently that the Committee, with their energetic Chairman at their head, have felt disposed to effect a change in the gas department. The Committee, it seems to me, are rather inclined to be crotchety, and, like all smart people, very hard to please. Mr. Veevers, it is well known, is a gentleman of great technical knowledge; clever and industrious. If anything, perhaps his knowledge is too excessive for Bolton, and it does not always suit a Committee to have for their servant a man who is wiser than themselves. If Mr. Veevers leaves Bolton, Bolton will lose one of the most intelligent Gas Managers in England. The ratepayers ought to call the Committee to account for what they have done, or, as it is said, contemplate doing."

## SOUTHWARK AND VAUXHALL WATER COMPANY.

The Half-Yearly General Meeting and an Extraordinary General Meeting of this Company were held on Thursday, the 13th inst., at the Offices, Sumner Street, Southwark—HENRY WHITING, Esq., the Chairman, presiding.

The SECRETARY (Mr. Alfred Jelley) having read the advertisement convening the meetings, the seal was affixed to the register of Shareholders.

The following report was taken as read:—

The Directors beg herewith to submit to the proprietors the half-yearly statement of accounts of the Company to March 31, 1878, which have been duly certified by the Public Auditor appointed by the Local Government Board, and by the Auditors of the Company.

The various Bills brought before Parliament affecting the water supply of the Metropolis have been withdrawn, and your Directors regret that, in consequence of these proceedings, the Companies have again been put to considerable expense.

A Bill promoted by the Thames Conservancy has been introduced into the House of Commons "for conferring on the Conservators of the River Thames further powers," &c., proposing that the several Metropolitan Water Companies drawing their supply of water from the Thames, shall each pay a further annual sum to the Conservators, irrespective of, and in addition to, any payments already made by the Companies. This Bill has been referred to a Select Committee of the House. Your Directors have thought it desirable to join the other Metropolitan Water Companies in opposing this Bill.

During the past half year 5652 yards of new main have been laid, of which 80 yards are outside our parliamentary area, rendered necessary in consequence of previous arrangements for supplying the district.

Eleven thousand five hundred pounds of the Company's mortgages, averaging 4½ per cent. interest, having come to maturity during the half year, have been paid off, and your Directors have placed a like amount of the Company's 4 per cent. Perpetual Debenture Stock in lieu thereof.

Tenders for the supply of coal have recently been obtained by advertisement, and a contract at reduced prices has been entered into for two years supply.

The reconstruction of the filter-beds, both at Battersea and Hampton, has been continued during the half year, and has resulted in further improving the quality of the water supplied. Your Directors have, however, much pleasure in stating that this important work is now approaching completion.

A special general meeting will be held immediately after the general meeting, at which a resolution will be submitted to the proprietors for the creation and issue of debenture stock to such amount as may be authorized, in exchange for mortgages or debentures now existing.

Your Directors recommend that a half year's dividend at the rate of 3 per cent. per annum, on the ordinary stock and class D shares, and 5 per cent. per annum on the preference stock and the preference shares of the Company, be declared payable on and after the 15th of July next.

The extraordinary charges against revenue have, as in the previous half year, very much diminished the dividend, but your Directors have the satisfaction to state that the Company is steadily improving its position.

*Dr.*—REVENUE ACCOUNT, FOR THE HALF YEAR ENDING MARCH 31, 1878.

| | | | |
|---|---|---|---|
| *Maintenance.* | | | |
| To Maintenance and repair of impounding and service reservoirs, filtering-beds, works, and pipes, for obtaining and storing of water, including the cost of materials and labour | £1,360 12 2 | | |
| Maintenance and repair of mains, pipes, fittings, meters, and works connected with distribution of water, including the cost of materials, labour, and renewals | 3,834 2 4 | | |
| Repairs of engines, &c., at the several works, included in Messrs. Harvey's accounts | 4,000 0 0 | | |
| Pumping and engine charges, including the cost of coals, wages, &c. | 9,970 9 5 | | |
| Filtration, including the cost of materials and labour. | 5,275 1 11 | | |
| Salaries of Engineer, Superintendent, and Clerks, and wages of Inspectors and Turncocks | 3,700 3 11 | | |
| Rents | 16 6 0 | | |
| Thames Conservancy | 500 0 0 | | |
| Rates and taxes | 4,354 9 1 | | |
| | | £33,511 | 4 10 |
| *Management.* | | | |
| Allowance to Directors | £506 5 0 | | |
| Allowance to Company's Auditors | 21 5 3 | | |
| Salaries of Secretary, Accountant, and Office Clerks | 1,005 6 8 | | |
| Superannuation | 200 0 0 | | |
| Commission to Collectors | 1,784 15 5 | | |
| Stationery, printing, and general establishment charges | 687 0 9 | | |
| Law and parliamentary expenses | 268 11 0 | | |
| Official Auditor and Water Examiner | 93 18 11 | | |
| | | 4,567 | 3 0 |
| Balance carried to next account, to provide for losses | | 4,000 | 0 0 |
| Dividend and interest account for transfer of profits | | 39,402 | 2 7 |
| | | £81,480 | 10 5 |

*Cr.*—REVENUE ACCOUNT.

| | | | | |
|---|---|---|---|---|
| By Balance brought from last account | £3,500 0 0 | | | |
| Surcharges on water-rental to 30th of September, 1877 | 2,428 7 1 | | £5,928 | 7 1 |
| Less allowances for empty houses | £1,519 1 11 | | | |
| Ditto overcharges | 801 8 9 | | | |
| Ditto bad debts | 1,251 2 11 | | | |
| | | 3,571 13 7 | | |
| | | | £2,356 | 13 6 |
| Water-rents accrued to the date of this account | | | 79,055 | 5 5 |
| Rents received | | | 68 | 11 6 |
| | | | £81,480 | 10 5 |

The CHAIRMAN said: The first resolution is "That the report of the Directors be received and approved." Before I ask you to confirm that resolution, I will make a few remarks, but I will not detain you at any length. At our last meeting, it was painful to your Directors to be in a position to offer you a dividend at the rate of only 2 per cent. To-day, however, the accounts show a much more favourable result, and they will, I feel certain, for some time, give you a fairly increased dividend. Your Directors are pleased to be in a position to recommend to you a dividend at the rate of 3 per cent., and to carry over to next year £4494 instead of £564 at our last meeting. This £4494, if divided, would enable your Directors to give you a dividend at the rate of 4 per cent. per annum. Your Directors have continued to effect reductions in the working expenses. I have a list of the reductions which I will give you afterwards. There is an increase to revenue from a revision of domestic rates, and of about £2000 in office rates. These office rates are the rates which we receive from parishes for road-watering, and also from railways—large amounts which we receive by cheque, and not by our collectors, and we pay no commission on them, and there is also a large increase from the extension of our district, for which purpose we have laid 5652 yards of new mains. Out of that quantity, about 3000 yards have been laid by our Contractors, Messrs. Aird, and the other 2570 yards have been laid by the Company's own men. We have also been making various alterations to existing mains, by which we have been enabled to give a more efficient supply, in reference to quantity and pressure. During the half year 1255 houses have been laid on, which are estimated to produce £1085 for half a year, or £2170 per annum. The alteration and reinstating of the filter-beds at Hampton and Battersea have made the quality of the water quite equal to any supply drawn from the Thames. This reconstruction of our filter-beds has deprived you of a large sum which otherwise would have

been applicable to dividend, but the end has now been successfully accomplished, so that after the close of the current half year such charges will disappear from the balance-sheet, leaving so much more revenue to be divided. A further saving has been effected in the consumption of coal during the half year of about £350, and your Directors have received tenders, and have entered into a contract with a responsible firm for two years supply, the effect of which, it is anticipated, will be to save revenue in future—about £800 a year. It is very satisfactory, as showing the growing confidence in the undertaking, that this half year £11,500 of the Company's mortgages at 4½ per cent., and some of them at 4¾ per cent., have been replaced at 4 per cent. This makes for the year ended March 31, 1878, £34,500 replaced at 4 per cent. from 4½ and 4¾ per cent. It is a matter of very great satisfaction to your Directors to be able to state that complaints from our customers at present are reduced almost to a minimum—complaints of non-supply of water or of its bad quality. As to the Bills promoted by the Metropolitan Board of Works, in reference to water supply, you will have gathered from the public Press that they have withdrawn them after very strong expressions against the measures by the public, as entailing on the ratepayers very seriously increased taxation. With regard to the Peckham reservoirs, your Engineer has been employed in testing their stability, and to enable us to judge what work will be necessary before filling them with water. Several of the Directors have been in the reservoirs with him, and we have had the advice of General Nicholson, of the Royal Engineers. The question of what is best to be done is still under his serious consideration. With these few observations I am now ready, on the part of the Board, to reply to questions upon any points which any Proprietor would like to have explained; but I should like, first of all, to read a few statistics to you, showing the economies which the Board have made. Last half year the law and parliamentary expenses were £1825. That chiefly arose, if you remember, from the negotiations in reference to the Battersea land. This half year they are £268 11s. This may appear a large sum, but I should like to give you the details of it. The general business of the Company has involved an expenditure of only £14, for we have really very little law going on now, because we have sufficient Directors who are able to advise as well as a lawyer. We have an action pending against our late Engineer, and that came to £120 for the half year. Then, as to Richmond, we had £2000 owing to us there, and it was suggested to us that if we applied to Richmond in a proper way, a good many people would give us a large portion of that £2000. We took Counsel's opinion, and the law bill was £42, and the counsel's fees £54, making £96 altogether. Police cases came to £30. That is to say, that in several cases where we had increased the rates and cut off the water because those rates were not paid, we were brought before the police courts, and we had to appear. I dare say that you all saw that there was a question of the Fire Brigade, and we had to oppose the Bill in Parliament, and this cost us £29. That made £280, and we received back from another Company, for whom we jointly opposed, £21, making your law bill £268. It used to be always £1000 every six months, so this shows an improvement.

A SHAREHOLDER: Did you not get anything from Richmond?

The CHAIRMAN: We got enough water-rates from Richmond to pay the collectors we employed. This was worth trying for—we paid £96 to try and get back £2000. As to the filtration, last half year it was £8488, while this half year it is £5275. Next half year—in the current half year, from March last to September next—the extra cost of filtration will drop down to £2300, which we have already spent, and that is totally finished. We have also the usual cleaning of sand, which may be £800 to £1000; but the extra charges for filtration will be £2300. The main and iron pipe repairs last half year cost £644, and this half year £1173. The reason why there is an apparent increase of £528 is this: At Wandsworth our filtered main and unfiltered main run side by side, and there was a connection between these two pipes. The Wandsworth people declared that we gave them unfiltered water through the filtered pipe; but the pressure on the filtered water was twice the pressure on the unfiltered, so that was quite impossible. However, they said they would be satisfied with nothing but our doing away with the connection between the two, and that involved an expenditure of £150. Then there were two bursts. When we took off the superincumbent weight of earth, the pipes were found to be very thin, and they burst; that cost £60, and compensation to a man whose house we damaged amounted to £25. Then we discovered that we had, at Nine Elms, two pipes running through a man's property, on which he was going to build, and through which we had no parliamentary rights to go. He said, "You must take away your pipes." They happened to be 15-inch and 12-inch pipes. Our Engineer arranged that we should move the pipes out of the way of the buildings the man proposed to erect, and that he should give us a perpetual easement. That involved a cost altogether of £200. Then there was an alteration to a 27-inch main, going over an arm of the river at Nine Elms, and another alteration of a 20-inch at Vauxhall Cross. These two last alterations were for the purpose of giving us an increased pressure in our district. That will exactly account for the increase in what we call main and iron pipe repairs. The plumbing last half year was £102, this half year it is £20; meter repairs last half year came to £55, and this half year to £10. Street work cost last half year £1883, this half year £1512. The establishment charges last half year were £620, and this half year they are £60 increase, which is a very small sum. The increase was made up of £12 for maps, £38 to the Phœnix Fire Office for insurance (this item coming in once a year), £10 to Dr. Tidy for analyses, and the fitting up of a supervisor's office. The collectors commission last half year was £1648, and this half year it is £1784; damages this half year the same as last half year, £72; and rates and taxes this half year, £4354, against £4129 last half year. We have all been reassessed, and they have put us up a little, but I think we have got off very well. The Auditor's charges are the same as last half year; storeage of water the same. Thames Conservancy £500 this half year, against £805 last half year—we pay more one half than another; superannuation this half year, £200, against £300 last half year. That is because we had an old collector, who was in our service some 30 years, and we gave him £100. The salaries in the Secretary's department show an increase of only £30, and we have taken on a junior clerk. The salaries in the Engineer's department are this half year £3700 against £2435, and, of course, you will want to know how this arises, so I may as well state it at once. The salaries of Engineer, Superintendent, and Clerks, and wages of Inspectors and Turncocks are what I have stated; but, instead of an increase, there is a decrease of £145. Our Turncocks used to have 26s.; but every other Water Company paid them 31s. We found that other Companies were increasing their works, and required Turncocks, and, unless we had advanced their wages to that paid by other Companies, we should have had them leaving us, and we should have had to take on other men in large numbers, and the district would have been badly supplied. It is only fair, too, to give them what they are worth, so we give them 31s., the same as other Companies. That involved an increased charge of £150. Then there were, in fact, no maps showing where the cocks in our district were, so we have taken on an extra draughtsman, and paid him £60. The deputy turncocks, in the late Engineer's time, were as many in number as the turncocks—25. Our late Engineer's plan was to charge all he could to revenue, and he used to put the wages of the deputy-turncocks to capital; but, of course, when our accounts were overhauled it was seen they were a revenue charge, and that came to £1200. Therefore, you have a charge to revenue of £1410 to add to £2435. Engine and premises repairs last half year cost £1228, and now they are £1053; but do not imagine that that £1053 has been spent on engine repairs. We are bound to put it under a certain head by the Government Auditor, but the engine repairs, instead of being £1053, are nothing of the kind—they are really only about £106. We do everything ourselves now, and £106 was spent in buying castings. The amount of tradesmen's bills we have paid this half year for repairs of engines was only £70, as against £140 last half year. The remainder of the £1053 is made up of £976, which is in our weekly labour-sheet, but which we are bound to allocate as engine, &c., repairs by the Government Auditor. I am now ready to reply to any question.

Mr. BADDELEY: Will you please explain the bad debts, £1251, in the No. 3 account?

Mr. BRADFIELD observed that a few months ago the rates were raised in the Borough, which caused a good deal of bother. He wished to know whether at that time the whole of the rates were raised, or only those in the Borough district. Had the Company not raised the water-rates generally? He understood that, if the Company were to charge the maximum rate, the Shareholders would have 10 per cent. dividend. Parliament was very severe on them in some things, but said they might do certain things. To raise the rate was a difficult thing, but they could do it.

Mr. BECKFORD said that the Company had not only raised their rates, but they had done it in what he would venture to say was a most improper way. No notice whatever was given of the increase of the rates, as if the customers deserved not the slightest notice or civility. He happened to be one of the Company's "unfortunate tenants," and one of their collectors called, leaving a paper, which, on examining and comparing with the previous one, he found showed an increase of some 15 or 20 per cent. Two or three years ago the same thing happened, so the last was No. 2. He did not know whether No. 3 was coming. The Company had nearly doubled his rates, and the same remark applied to every one else in his district. He thought if the money was wanted the thing might be done in a civil and proper manner. He thought a notice ought to be sent of any increase in the rates, and he suggested that if the Company increased them again notice should be given, and the reasons stated for the increase. Again, he thought hitherto their assessments had been haphazard, but he thought they should go on some principle. He might mention that the collector in his district came with the account. He was seldom at home, and the collector said he would call, or he (the speaker) might have the privilege of sending the account. He could only say that the collector would have to wait a very long time, and he thought the collector might say that he would call again on a certain day for it.

A SHAREHOLDER observed that that was the custom in the case of the New River Company.

Mr. MANNING said the Chairman had referred to an action pending against the late Engineer, and as to that matter he wished to make a few observations. The late Secretary's superannuation was £300 a year. The Board, at the last meeting, stopped this superannuation during the trial of the action he had mentioned. It seemed to him rather hard that Mr. Robinson's allowance should be stopped during the action, and while there was doubt. In Criminal Courts the prisoner always had the benefit of the doubt. He wished to know whether this money was withheld from Mr. Robinson in perpetuity or only temporarily.

Mr. STURGE wished to ask a question as to the superannuation allowances. His point was whether the Shareholders had the power to make any grant, except at the half-yearly or yearly meetings of the Company. The Shareholders were always fluctuating, and all of the Shareholders that day would not be Shareholders a year, or even six months hence, perhaps. The doubt in his mind was whether the Company had any right to make a grant for a longer period than a single year, and he thought, if they had not this right, the question of superannuations would soon be decided. He held that such charges must be an annual vote.

Mr. ILSLEY said they had heard that day of charges being made against capital account which ought to have been made against revenue. He remembered that some time ago they had the same peculiar state of accounts before them. He wished to know whether, since the close of the accounts, anything further of the same kind had arisen. Were they on "sound ground" yet? As to the question of supply, they had heard that day the complaint of a customer; and he thought it was a good thing for them to hear what the feelings of their customers were, as well as to look at this question from their own point of view as Shareholders. The customer to whom he now referred had complained of want of civility. In any trading company that was a just cause of complaint, and they should do all they could to remedy the matter. At the same time, he thought there was not so much in this complaint as in the increased charge. He thought that the public should consider that this Company, and all Metropolitan Companies, had been called on to expend immense sums of money to improve their supply of water. This Company had spent a large sum of money in this way, for which they received no benefit in the shape of dividend. The expenditure had been simply to improve the supply, and, that being so, he thought they had a right to ask the consumers to pay the Company a better price for a better article. He thought there was just cause for asking their customers to pay, if not to the uttermost farthing, still considerably more than they had been in the habit of paying hitherto.

Mr. BADDELEY was inclined to agree with much that had been said by one of the spakers as to incivility. He, however, had always found it best to pay at once any tax which he was called on to pay, and so prevent the collector, if he was inclined to be uncivil, from being uncivil at his doors. No collector of any kind ever called at his house a second time, for he always found it the "better part of valour" to send the money at once. He would now repeat his question as to the bad debts. There was a sum of £1251 in this half year's accounts, as against £700 last half year. This was a very serious item. The amount was not for bad debts composed of empty houses and overcharges, for these items, taken together, amounted to £3571. He was sure they were indebted to the Chairman for the very detailed account which he had given. With regard to the sixth paragraph in the report, referring to the tenders for coal having been obtained by advertisement, that advertisement struck him, when he saw it, as being very peculiar. Why a fee of 21s. should be exacted from every one who wished to tender for the supply of coal to the Company, he did not understand. The more tenders they had, the better; but the Directors restricted the number by a kind of tribute-money. He could only express his thanks to the Directors for the great attention they had given to the affairs of the Company during the past half year.

The CHAIRMAN, in reply, said: Mr. Baddeley first asked us to explain why the bad debts are £1250 instead of £704, as last half year. Well, I may tell you that in "ancient days" the Chairman was dictator of the Company; but at the present time we are all equal, and any matter of dispute is put to the vote. My own private opinion is that we have not enough collectors. Other people, however, think that we have; but I do not think that our money is got in as rapidly as it would be if there were more collectors. There are nine collectors, and I believe we should save a consi-

derable amount of bad debts if we had more collectors, and collected our money more quickly. The matter, however, has been fairly discussed by the Board, and been put to the vote. We have an arrears collector. We get from new houses put on, a quarter in advance, without which we refuse to put a house on. The Secretary has just informed me that this half year's bad debts do not arise from what I thought, the inadequate number of collectors, but from Richmond. That did not strike me at the time. Personally, however, I entertain the belief that, if we had more collectors we should get our money in more certainly. Mr. Baddeley has asked a question as to tenders for coal, but I think he has almost answered that question himself. If we put tenders out publicly, we might have 200 tenders sent in. If a man is serious, he does not object to pay 21s., which is really a very small item on an amount of £12,000 or £14,000.

The ENGINEER (Mr. Thos. W. Rumble) observed that this was the usual charge, and he did not think it kept people from tendering. His experience extended for 30 years.

A SHAREHOLDER asked who took the money sent in with the tenders.

The CHAIRMAN: The Company. I guarantee that there is not a shilling misappropriated, to the best of our belief. Mr. Bradfield asked about the rates. We found the houses in our districts were rated by the "rule of thumb." A man looked at a house in "ancient days," and said: "We will rate him so and so. If he is a friend of mine, we will rate him low." What did the Directors do? They appointed a supervisor of the rates—a man who had lived in the neighbourhood 24 years, and was acquainted with every house in the district. He cannot re-rate every house at once, but in the Borough we found that there was great discrepancy. As to the question of raising our rates, I will read you an extract from the JOURNAL OF GAS LIGHTING, ETC. It says: "Lambeth is protesting against the increased rates levied by the Southwark and Vauxhall Company. There can be no doubt that, for some years past, the district has been under-assessed, and now that the Company are in what we may call low water, it is not unreasonable that they should endeavour to increase their revenue by all legal means. They are fully justified in the step they have taken. Of course it is disagreeable to have to pay increased charges; but such *désagréments* happen to people every day, and they are borne with composure, if not with satisfaction." As to the Borough, there are large hop warehouses there, one building is rated at £1800 a year, and we charge the person to whom it belongs £3 or £4. He said the water was simply for his men to wash their hands with. If they were under the Metropolitan Board of Works, every proprietor of a warehouse would be called on to pay 3d. in the pound, as what they call the public rate for watering the roads and the water for extinguishing fires; 3d. in the pound upon £1800 is £22 10s. We had a complaint to-day from a warehouseman, saying that we had put him up from 5d. or 6d. to 10d. If he was under the Metropolitan Board of Works, he would certainly have to pay the public rate of 3d. in the pound, and I believe a part of the domestic rate of 9d. We were asked by the same Shareholder why we did not send out a notice as to increasing the rates. I can only tell him that I am supplied by this Company; and when they told me that they were going to call on me for so much money, I said, "I shall not only refuse to pay it myself, unless you give me notice, but I shall advise every one else to do the same." That gives you what my idea on the matter is—of what is due to our customers; but since then the Board have passed a resolution that notice of increase shall be given to all customers. As to the suggestion that notice should be left when the collector will call, that is done nearly always; but our collectors have been very much pressed, and I suppose in certain districts the collectors have forgotten to do it. In my district the collector says that he will call on such a day. We will inquire into this matter, and the collectors shall have orders to say when they will call. Mr. Manning has asked a question about Mr. Robinson's salary. I believe that Mr. Sturge has given notice that he will bring forward a motion which will dispose of that question. Mr. Sturge asks to whom £200 superannuation is given. There is £50 given for the half year to a collector who was in our service 38 or 40 years, to whom we allow £100 a year, and the other £150 is six months of Mr. Robinson's superannuation, which remains as a liability to us till the Shareholders decide what to do in this matter. As to Mr. Ilsley's remarks, the accounts have been sifted by the Government Auditor, Mr. Stoneham, by his deputy, Mr. Vaughan, and by the Directors, and we feel convinced that there is no single liability whatever in any shape—in the Engineer's, Secretary's, or any other department—which will come against the revenues of the Company.

Mr. STURGE wished to call the attention of the Shareholders to the circumstances of the £200 for superannuation. He understood that £50 was for a half year's superannuation to an old collector. He did not ask that this grant should be rescinded, but he wished to bring before the Shareholders, and the Directors especially, the question whether, if that grant was to be continued, it ought not to be regularly moved year by year, and not be considered something in perpetuity, as the Shareholders and the parties interested in the Company were always varying. He therefore thought that it was very doubtful whether it was legal for them to grant annuities in perpetuity. It would be open to any gentleman who pleased to move this £50 to the old collector; but his main object in rising was in connection with their late Secretary. It was very well known to several gentlemen that two or three years ago, when Mr. Robinson retired, the question of a grant to him—which he (Mr. Sturge) contended could only be an annual grant—was mooted at their meeting, and after a great deal of discussion it was fixed that £300 a year should be paid him. After that, when they met on another occasion, they found that the Directors had discovered that there were certain culpable irregularities connected with their late Secretary, and such irregularities that decided them that it was proper to suspend his allowance; and when the subject was mentioned to the Shareholders, they assented to what the Directors had done, leaving all the responsibility with them. Well, now he thought that the time had come when the Shareholders should consider whether they ought not, as Shareholders, to move a resolution, which he was prepared to do, rescinding the grant to their late Secretary, in consequence of which no further payment should be made to him. He did this the more readily because he happened to hold in his pocket an account of 100 guineas paid to his son while the latter was attending a day school. The boy was called a clerk in the office; and he understood that he spent little of his time in the office excepting on those days when the Directors and Shareholders were likely to see him—diligently attending school at other times. Under these circumstances, he thought it was altogether culpable on the part of his father to allow his boy to receive, between June 20, 1873, and Feb. 4, 1875, the sum of £105, being a series of quarterly payments. Under all these circumstances, he thought they would be quite justified, first of all, in passing a resolution giving him nothing further, and requesting the Directors to take the necessary steps to get the £105, improperly paid to his son, refunded.

Mr. ILSLEY thought that, as there was a question of law involved in this, it ought to be settled. If it was contended that they had only the right at such meetings as this to pass a resolution referring to the ensuing half year or previous periods, and not in perpetuity, such a resolution as Mr. Sturge had put before them would not be required.

Alderman KNIGHT, a director, said the Board would listen to no one more readily than to Mr. Sturge, who was a large Shareholder, and who brought matured judgment and sound discretion to anything he proposed. He was not aware that Mr. Sturge was going to bring forward this motion, or else, if he had had the opportunity to advise him, he would have said it required a little more consideration, and was not a matter which could be done in a hurry. If they were to do a thing of this sort, they had better err on the side of consideration and mercy. He suggested the advisability of Mr. Sturge consulting with the Chairman and Solicitor of the Company, and letting his resolution appear as a notice of motion for their next meeting. Their late Secretary had many friends among the Shareholders, and he suggested that no one should have the chance of saying, "I did not know that this resolution was going to be brought forward, or else I should have been here to defend my friend." He was much inclined to Mr. Sturge's view that such sums of money could only be voted for the coming or for the past year, so as not to bind future Shareholders. He urged that Mr. Sturge should not only be strictly right, but also strictly kind and considerate to Mr. Robinson, and that he should put himself in communication with the Secretary, who would put himself in communication with the Solicitor, and then, if so advised, he could give notice of motion for their next meeting, and so let every Shareholder know of it. He himself had never seen Mr. Robinson in his life, but he knew, through the Chairman, the circumstances to which Mr. Sturge had referred, and he (Alderman Knight) then said that Mr. Robinson had no right to any more of the Company's money.

Mr. STURGE acquiesced in the suggestion, observing that if all the circumstances had been known he felt positively certain that nothing would have been granted as a retiring pension to the late Secretary. With regard to the £200 for superannuation, he could not see why, if it was not paid, it had got into the accounts. He thought it really belonged to a suspense account.

The CHAIRMAN said they were bound to put into the accounts every liability that they knew of, and which they might be called on to pay. They, therefore, put it in the accounts as a liability.

Mr. STURGE: If you had made a note, "Claim not allowed," I should have been satisfied.

The CHAIRMAN: Well, the money is not paid.

Mr. BADDELEY asked whether the Secretary's allowance was not stopped at the last meeting, and what stage the action against Mr. Quick had reached.

The CHAIRMAN said Mr. Robinson's allowance was stopped temporarily at their last meeting. They did not know when the action referred to would come on. Interrogatories were issued; they had to reply, and therefore they could state no certain time when the action would come on, but they were going on with it. There was no action against Mr. Robinson.

Mr. STURGE having made a few further observations relative to his notice of motion, said they might, in the course of the communications between the Secretary, the Directors, and their Solicitor, get the point settled, which he thought of great importance, whether they could grant annuities in perpetuity, or whether any grant ought to be an annual grant.

The resolution of Mr. Sturge was then varied in accordance with the suggestion of Alderman Knight, and made a notice of motion for next meeting.

In reply to Mr. Manning, who said the reason given on a former occasion for withholding Mr. Robinson's allowance was till the action pending against Mr. Quick had been decided, no reference being made to his son's salary,

The CHAIRMAN said that the circumstances had come to the knowledge of the Directors since the pension was granted to Mr. Robinson. They had nothing to conceal, but the representatives of the Press were present, and they did not wish to make everything in relation to this matter public, but if any Shareholder desired to see why the Directors had altered their opinion since the grant was made to Mr. Robinson, he would be happy to show him the proofs on which they went.

Mr. COOPER asked how many years the charge for deputy turncocks was made against capital instead of revenue.

The CHAIRMAN said he did not believe the accounts of the Company had been kept in the order in which they should have been for very many years. In order to give the Shareholders big dividends, everything that could be put to capital, justly or unjustly, was put to capital. The deputy-turncocks were the people who did the ground work, and because they did the ground work, and cost £1200, and the turncocks did turn the cocks, also costing about £1200, the turncocks were charged £1200 to revenue, and £1200 for the ground work men was charged to capital. Of course, when the Government Auditor came to look into the matter, he said that the latter was a revenue charge, and must be charged to revenue accordingly.

Alderman KNIGHT said Mr. Baddeley had very properly referred to the large amount of what appeared to be bad debts—£1200. He should not have said anything on this matter had not the Chairman said that this was owing to their having too small a number of collectors. In his (the speaker's) capacity as a member of the Commissioners of Sewers, he presided over a Committee to inquire into the capacities of collectors. They found that, as to the poor-rates, many collectors collected from 4000 to 7000 houses, whereas none of the Company's collectors had more than 1200 houses. These bad debts were not attributable to a want of collectors; but where an old collector retired, and they could with advantage give a portion of his district to some other, so as not to increase the total expenses, they had done so, and they had come to this conclusion, in order to meet to some extent the views of the minority of the Board, who thought they should have more collectors. The bad debts were really less than last half year's, although they stood at £1200. This, however, was, as he had said, not due to want of collectors, but because £600 odd was from Richmond. The bad debts were really about £100 less last half year. As to the 21s. paid with regard to the coal tenders, a remark was made, or a fear expressed that this was a perquisite going into the pockets of some one. The Board, however, had set their faces sternly against perquisites. They insisted on having everything reported to them, and they did not allow any officer to do anything on his own account. Every penny now went into the hands of the Company. As to the complaint of want of civility, this matter was carefully gone into by a Committee of the Board, and they then said that every one who had his water-rate increased should have given to him the particulars on which the increase was based. If a man came to the Board they did not lay down a hard-and-fast line, but they said that, while representing the interests of their Shareholders, if he could show them that he was really using scarcely any water at all in a large warehouse, where they might make a considerable charge, they would make every allowance, and he did not know where they had not come by this means to some satisfactory conclusion. They were not there to drive a hard-and-fast bargain with the public—they were there as a trading community to make a fair profit for their Shareholders, and wherever they felt that they ought to depart from the parliamentary basis they were ready to do so.

Mr. C. M. VIALLS, a director, then formally moved the following resolution:—"That the report of the Directors, this day read, be approved and confirmed, and the recommendations therein contained adopted."

Alderman FINNIS, a director, said that he seconded the motion with

very great pleasure, as from what he knew of the Company at the present time, and, in the time of the former Board, their affairs were conducted as business matters ought to be. There was no such thing, when he came, as Committees of their various departments, but now there were such Committees. From what he had seen of the working of the Board in the past twelve months, he was convinced that they would be able to show a most satisfactory account in two or three years time.

The motion was carried unanimously.

Mr. MANNING moved, and Mr. WHITE seconded, the next resolution—"That the following dividends be declared, payable on and after July 15, 1878, at the rate of 3 per cent. per annum on the ordinary stock and class D shares, and 5 per cent. per annum on the preference stock and the preference shares."

The motion was carried unanimously.

The CHAIRMAN: The meeting is now made special. We are authorized to issue £432,000 of mortgages and debentures. We have already turned £400,000 of terminable debentures into debenture stock at 4 per cent., and now we ask your authority to turn the remaining £32,000 of terminable debentures or mortgages into 4 per cent. debenture stock.

Mr. ILSLEY moved—"That debenture stock bearing a perpetual preferential interest not exceeding £4 10s. per cent. per annum, be and is hereby created to the amount of £32,000, for the purpose of paying off mortgages or bonds of the Company to a like amount, and that all such debenture stock shall rank *pari passu*." The resolution further empowered the Directors to issue it at such times, to such persons, and on such terms and conditions as they might think fit.

The CHAIRMAN, in reply to a question, said they were going to change 4½ per cent. into 4. They had put out £10,000 at 4 per cent., at a premium of three-quarters per cent. The premium went to the reduction of capital.

Mr. STURGE asked if the Directors expected to get this money at 4 per cent., because he observed in the resolution that it was not to exceed 4½ per cent. He was inclined to think that the resolution should state not to exceed 4 per cent., and thought that the credit of the Company was likely to be damaged if they offered 4½ per cent. for what other Companies got for 4 per cent.

The CHAIRMAN said that 4½ per cent. was fixed some years ago, when money was not so cheap as it was now. They were now, however, getting it out at 4 per cent., and less. He saw no objection to making the alteration suggested in the resolution. It was only a question of £32,000. He was quite sure that if they wished to put it out within a fortnight they could get it changed. They could only do this, however, as the mortgages became due.

A SHAREHOLDER inquired who had the transfer fees.

The CHAIRMAN, in reply, said they went to the Secretary.

Mr. JELLEY said the Secretary had the transfer fees, the fees being 2s. 6d. instead of 5s., as formerly, and the amount was about £30 a year.

Alderman KNIGHT said he had not known this before.

Mr. BADDELEY thought no gentleman connected with the Company ought to receive anything unless the money appeared in the accounts. He was the Auditor of a Company where the Secretary had the fees, but the fees were received and placed on one side of the accounts, and a cheque was given to the Secretary for the amount. He thought a resolution should be passed to that effect.

Alderman KNIGHT intimated that he would move such a resolution at the Board.

The CHAIRMAN pointed out that their late Secretary had £1400 a year, and attended at the office on an average two days and a half a week, stopping two or three hours, whereas their present Secretary, since the departure of Mr. Robinson, worked ordinarily for the first year and a half from nine in the morning till six at night, sometimes till ten and eleven o'clock. At the present time, all the officials came at half-past nine in the morning, and stopped till half-past five, office hours generally being from ten to four.

Mr. BADDELEY seconded the resolution, and it was carried unanimously.

Mr. ILSLEY moved a resolution according the best thanks of the meeting to the Chairman and Directors, for thier services during the past six months. He was sure that the resolution needed no comment from him, particularly after the somewhat lengthy time they had been discussing their affairs.

The motion having been seconded,

The CHAIRMAN, in reply, said: We are all very much obliged to you, and the much smaller attendance this time than last evidently shows that the Shareholders feel pretty confident their affairs are going on right. I am bound to tell you that it is owing in very great measure to the labours of our *employés* that we are able to increase the dividends.

The proceedings then terminated.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Beyond the fact that the Whitsuntide holidays have during the past week put a stop to every description of business, there is little or nothing to report. On the Manchester Exchange, a close holiday has been observed since Tuesday, many of the places of business have been closed for nearly the whole week. The majority of the collieries in the Manchester district have been stopped for four or five days, and in some cases for the entire week, as not only are heavy stocks held, but it has been next to impossible to move coal either by rail or canal, as the Railway Companies have required their lines to be kept clear for the extra holiday passenger traffic, and the canals have been closed for repairs.

In other Lancashire districts, where the holidays are not so generally observed as in Manchester, there has also been very little work doing; and with regard to the iron-works, these have been closed in most cases for the greater part of the week.

So far as the very limited amount of business that has been doing in either the coal or iron trades is concerned, this can scarcely be taken as any guide to the real condition of the market, and prices nominally are the same as last week. There is, however, still an evident weakness in the price of coal, and so long as the market is overstocked, and there are so many needy holders pushing for sales, consumers naturally are able to buy on pretty much their own terms. With regard to iron, there is no material change, so far as local brands are concerned, as Lancashire makers are already losing money, and are not prepared to go lower, although they are still undersold by iron offering from other districts.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The shipments of gas coal from the Tyne Dock still keep up to a full average. Of course, the principal demand is for the best qualities. The leading gas coal pits are tolerably well contracted over the year, and work well up to full time. Second-class collieries fall very short of that; half time is rarely exceeded. The price of gas coals in the open market is about 7s. best, and 6s. seconds, net. The same observation applies to steam coals. Most of the best collieries in this trade do pretty well, but second-class pits hardly come up to half time, and prices are very irregular. There is no local demand for coals. As a rule, small and manufacturing coals are a drug. Small coals in any quantities can be delivered aboard ship at from 2s. 6d. to 3s. 3d. per ton.

The coasting coal trade is flat and dull. About 4s. 6d. per ton, and in some instances less than that, is paid steamers to carry coals to London. The rate for small sailing ships, to discharge gas coals at the wharves below London Bridge, does not exceed 5s. 3d. per ton. In some instances sailing brigs have been fixed at 1¼d. per ton less. There is very little business doing to the Dutch or French ports, and freights are equally low. Rates are down about £1 per keel to Cronstadt; they now stand at £8, and there is a fall of freights to the Mediterranean. Generally speaking, therefore, the whole course of the freighting trade at present favours shippers. There is little speculation anywhere, except in the direction of companies or merchants picking up lots of coals at a bargain.

With regard to the manufacturing trade of the Tyne and North of England generally, the more settled appearance of the Eastern Question with the not very remote prospect of peace, tends to improve its tone. The measure of its prosperity may be indicated by the quotations in the chemical market, which show a rise of something like 1 per cent. There is more disposition, too, on the part of foreigners, to import north country pig iron at the present rates. The fire-clay goods trades, with the cement business, do not look so depressed either, though there may be no material alteration in prices. It is not expected that there will be a resumption of active business until the close of the Conference.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

On Thursday last a meeting of the Perth Corporation Gas Commissioners was held, when the subject of the estimates of income and expenditure for the ensuing year were under consideration. In moving the adoption of the estimates, Treasurer M'Kenzie said that they had not now so large a surplus as at this period last year, which was chiefly to be accounted for from the fact that the estimates were exceeded by £400. The expenditure of the current year, however, would not be nearly so large, and he thought that, with care and economy, they would manage to furnish the community for another twelvemonth with gas at 4s. 2d. per 1000 cubic feet. The motion was seconded and agreed to. At the same meeting, notice was taken of the recent death of Mr. James Morrison, who had acted for many years as Auditor to the Gas Commission. That gentleman had rendered very valuable service to avoid a parliamentary contest at the time the gas-works were being acquired on behalf of the public, and his efforts in that respect were completely successful. On the motion of the Treasurer, seconded by the Lord Provost, a resolution was passed, and recorded in the minutes, expressing the Commissioners sense of the services which Mr. Morrison had rendered, and regret at the loss which they had sustained.

The Municipal Authorities of Edinburgh, in view of certain alterations being made in their famous Princes Street, recently expressed a desire that a subway might be made for containing the gas and water pipes, and in order that the repairs required on the same, from time to time, might be executed with as little inconvenience as possible. A conference was held on the subject during the past week, which was attended by representatives of the Town Council, the Water Trust, the Gas Companies, and the Road Trust. It was stated that such a subway as was contemplated would cost from £7000 to £8000. A good deal of discussion took place, in the course of which Mr. John Reid, of the Edinburgh and Leith Gas Company, stated that subways had been proved to be very dangerous, and recommended that the Authorities of towns where such tunnels had been tried be communicated with before any resolution was passed. The conference broke up without the proposal to construct a subway being agreed upon.

An extraordinary general meeting of the Peterhead Gas Company was held on Wednesday, to consider and, if approved, to pass a number of resolutions relative to the transference of the gas management from the Company to the Corporation of the town, in terms of a resolution of the Town Council to that effect carried in the autumn of last year. There was a good attendance, and the following resolutions were put to the meeting:—"1. That the business hitherto carried on by the Company, and all the rights, powers, and privileges, and all the lands, premises, works, plant, stock, and whole other property of the Company, be sold and transferred to the Town Council of the Burgh of Peterhead, in terms of resolution by the Council to that effect under the Burghs Gas Supply (Scotland) Act 1876, and that at mutual valuation—the payment of the purchase price to be either by a capital sum of money or annuities, or partly a capital sum of money and partly annuities, as may be agreed on with the Council. 2. That a party or parties be appointed with all the powers necessary to arrange and conduct said sale and transfer, and to grant, execute, and deliver whatever writs may be necessary to transfer the moveable property of the Company to the said Town Council. 3. That the Trustees to whom the heritable subjects of the Company are vested be authorized to grant, execute, and deliver the necessary conveyance thereof to the Town Council." These resolutions, after deliberation, were unanimously carried, and at a meeting of the Town Council, to be held at an early date, they will be submitted for the consideration of that body.

The annual meeting of the Galston Gas Company was held last Tuesday, when a statement was submitted which showed that the affairs of the Company were in a prosperous condition. A dividend of 7½ per cent. was declared on the capital stock.

At the annual general meeting of the Blairgowrie Gas Company, on the 13th inst., it was resolved, on the recommendation of the Directors, to declare a dividend of 6 per cent., being the same as for several years past. In accordance with another recommendation by the Directors, it was agreed to call a special meeting of the Shareholders to consider the propriety of issuing new stock for the amount of the debt incurred by the improvements and alterations of previous years, instead of paying interest yearly upon the same.

The annual meeting of the Shareholders of the Kinross and Milnathort Gas Company was held last Wednesday—Mr. R. B. Begg, Chairman of the Company, presiding. From a statement submitted by the Directors, it appeared that the affairs of the Company were in a highly satisfactory state, and it was agreed to declare a dividend of 5 per cent., to reduce the price of gas, to hand over a considerable sum for the reduction of the debt, and to make an addition to the salary of Mr. Page, the Manager of the works.

The Dunoon Gas Company, at the annual general meeting, held on the 8th inst., resolved to declare a dividend of 10 per cent., and to reduce the price of gas 5d. per 1000 cubic feet—from 6s. 3d. to 5s. 10d.

A dividend of 5 per cent. was declared at the annual general meeting of the Stonehouse Gas Company on Wednesday last. It was reported that the debt due by the Company was now £500, and that the amount of shares held by the Shareholders was 1117 shares of £1 per share, fully paid up.

At last Thursday's meeting of the Town Council of Hamilton, it was agreed that, in consequence of the burgh extension, and additional gas

supply required for the district included, new purifiers and exhausters should be provided during the summer months, and that the Gas Committee should at once take estimates for the same, with power to accept and close should they be found satisfactory.

Dr. Wallace's report on the illuminating power of Glasgow gas during the week ending the 8th of June shows that in no instance was the minimum below 26·06 standard candles, while the average ranged from 26·77 candles to 27·43 candles, and the maximum from 27·17 candles to 29·11 candles. The report does not give any results for the western district.

At the meeting of the Town Council of Edinburgh last Tuesday, there were submitted reports of analyses of the gas supplied to Edinburgh, which the city analyst had made on two occasions in the previous month. They showed that on the first both Companies gases were equal to 27·8 standard candles, and on the second the Edinburgh Company's gas was equal to 28·70 candles,and that of the Leith Company to 27·20 candles.

The Bridgend Water Company's works have been sold to the Perth Corporation Water Commissioners for the sum of £1428 18s.

The Glasgow pig iron warrant market was somewhat dull during the greater part of last week, but a large amount of business was done at lower prices. The final prices on Friday were 2d. under those of the previous Friday.

A marked degree of dulness still characterizes the Glasgow coal market, orders being scarce, and prices low and unprofitable.

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Death of Mr. John Rofe.—We were unaware of the fact, until we met with an obituary notice in the *Geological Magazine*, that this estimable gentleman, well known, in years gone by, to Gas Engineers and Managers, died on the 11th of April last. From failing health, Mr. Rofe had long retired from connection with gas-works, and devoted himself to his favourite geological studies. He was born in London in 1801, and as he grew up, studied engineering under his father, Mr. J. Rofe, C.E., with whom, in partnership, he subsequently carried out some important undertakings in gas and water works. "On several occasions," says our contemporary, "he gave valuable evidence in Parliamentary Committees, with reference to towns water-works and gas companies Bills, in which his sound geological knowledge proved of great service to him. In 1827 he settled at Preston as Engineer to the gas-works, a post which he held for 25 years."

Hartlepool Gas and Water Company.—A meeting of the Shareholders in this Company was held on the 13th inst.—Mr. T. R. Holmes in the chair—when it was resolved—"That 6816 new shares of £10 each be issued under the provisions of the Company's Act of this session; that 4816 of such new shares, representing the water capital of the Company, be allotted to the present Shareholders in the proportion of about one new share for every eight shares now held by each Shareholder, and that the remaining 2000 new shares, representing the gas capital of the Company, be sold by public auction, in accordance with the 9th section of the said Act, at such times and in such manner as the Directors may hereafter determine, and as the necessities of the Company require." It was also resolved—"That the first call on such new allotted shares be £2 per share, and be payable on or before the 1st day of August next; and that the amount of all subsequent calls on such allotted shares be made at such times as the Directors may from time to time determine."

Cast and Wrought Iron Water Piping.—The Hessen *Gewerbeblatt* remarks that it is well known that iron rich in carbon is less subject to oxidation than iron poor in carbon. Wrought iron, therefore, exposed to influences which promote oxidation, rusts more rapidly than cast iron. The very simple experiment of laying samples of both sorts in damp earth, and leaving them there for a sufficient time, will show the difference in their rates of rusting. The duration of wrought piping when laid is thus likely to be less than that of cast piping, and this is proved to be the fact in practice. Commonly speaking, the temperatures of water running through piping in use is lower than that of surrounding bodies, and the walls of the tube are constantly condensing moisture, which powerfully promotes rusting. In houses, or in masonry conduits, where the pipes can be got at and kept protected, by tarring, painting, or otherwise, from rust, wrought-iron tubing can be used with advantage; but in earth it is otherwise. An experienced engineer, who has often had to lay wrought-iron piping in short lengths below ground, has always found them, before long, more or loss destroyed.—*Iron.*

A New Advertising Dodge.—A contemporary remarks that economy in American cities with their gas lighting arrangements seems to be the order of the day since Chicago has taken steps in that direction. Pittsburgh has followed, but in an entirely novel manner. It is proposed to erect three lighthouses that shall throw "such a flood of light that anywhere in Pittsburgh or Alleghany a pin could be seen if lying on the pavement in the darkest night." The lights are to be so located that a perfect crossing of the beams will be effected, thus neutralizing the shadows. The promoter of the idea intends, if acceptable. to raise capitalists who will build and equip lighthouses and run them 17 years without cost to the city. What is required of the city amounts to this: All the lamp-posts are to be handed over for the use of the Company, to be fitted up as advertising mediums by means of revolving caskets, and the income to be derived therefrom to go into the pockets of speculators. At the termination of the 17 years, the city, on payment of original costs, takes over the whole apparatus.

Gas Companies Accounts.—Mr. C. Crowther Smith, the Secretary of the Southampton Gas Company, has prepared a set of half-yearly accounts, based on the form adopted by the Board of Trade. These accounts, which primarily were intended for the use of his own Company, are, *mutatis mutandis*, applicable in every case, and, as presenting in a minute and comprehensive manner a general view of the financial condition of an undertaking, seem to leave nothing to be desired. The account forms are printed on very large sheets, and in the specimen before us are made up into a volume of some 48 pages, strongly bound and lettered. The first ten pages are occupied with the statements of capital, revenue, profit and loss, &c., &c., in the prescribed form, with the added line of "Premiums on Sale of Shares by Public Auction," in the statements B and C. The five following pages are devoted to "Capital Expenditure and Receipts during the Half Year," in detail, with some added particulars. Page 16 is utilized for an account of "Coals Carbonized or Used, and Average Cost of Coals during the Half Year." Pages 17 to 26, inclusive, are headed "Analysis of Expenditure on Revenue Account." Page 27, "Summary of Gas and Meter Rentals;" pages 28 to 33, "Residual Products, Rents, and other Items;" page 34, "Interest on Temporary Loans, and Interest on Money Deposited;" page 35, "Interest on Amount Invested;" page 36, "Unpaid Dividends and Cheques;" pages 37 to 39, "Sundry Tradesmen and Others, for Amounts Due for Coals, Stores, &c." The remaining pages are to be used for account of "Stocks on Hand," "Gas and Meter Rentals Due," "Consumers Deposits," "Coke and other Residuals," and "Sundry Accounts Owing, as per Ledger." Mr. Crowther Smith has bestowed a large amount of care and attention in compiling these forms of account, and they are printed and ruled up in a very superior manner.

## Register of New Patents.

4381.—O'Neill, A., Baltimore, U.S.A., "*Improvements in modes of constructing and laying mains and service-pipes for water, gas, and other similar purposes.*" Patent dated Nov. 11, 1876.

These improved pressure-pipes are constructed with a chilled convex spigot end, with a fillet, on which are formed connecting lugs with convex faces fitting corresponding concave faces, lugs, or flanges, in the bell end of the next section, the curvature of the working faces of the lugs affording play to the joint. The bell end is constructed with an annular seat for the reception of a gasket of lead, soft rubber, or other compressible material, which is formed on either face with a feather edge, or annular lip, to adapt it to be more readily compressed to fit the seat in the bell and the pipe end which presses it on to the seat. The gasket is also formed with radial lugs, fitting in corresponding notches in the bell, to prevent its rotation as the spigot end of the pipe is twisted into position. The bell is also formed with an internal flange and annular recess, to adapt it for the reception and packing of a cut or a common pipe, the end of which may be of plain cylindrical form, and not furnished with the peculiar coupling lugs. The shoulder of the bell is formed with radial flanges for the reception of a twisting jact, or of a jenny, by which the last section is held while the new one is twisted in position. The inclined shape necessary to give the action of a screw to the coupling lugs may be made on the lugs of the spigot end, or the flanges of the bell end, or both. A suitable stop is provided to limit the turning of the spigot end within the bell. A dead end, with coupling devices similar to those on the spigot end of the pipe, is provided to close a terminal section.

The invention further consists in the provision of a ferrule with a tapering spigot end, surrounded by a thimble of soft material to form a service connection by driving the thimble into an opening which may be drilled in the main-pipe.

The invention further consists in providing a T, or intersection, with a gasket seat and flanges analogous to those of the pipe bell, for the reception of an annular cap, or a service T, or a plain service-pipe.

The invention further consists in the peculiar construction of a cap to close the outlet, and to either hold a tight gasket or to receive a pipe, which may be screwed into the annular cap at will.

4459.—Gent, P., Congleton, "*Improvements in and appertaining to gas stoves.*" Patent dated Nov. 18, 1876.

The first portion of this invention consists in a novel method of applying water inside a close bell-shaped or pillar gas-stove. The water being heated by the gas-burner gives off a moisture which vaporises throughout the stove, and acts as an absorbent or condenser of the odours and impurities usually generated by such gas-stoves. The second portion consists in applying a wire gauze or perforated metal guard round the burners of gas-stoves, so as to prevent the flame from being affected by sudden draughts of air. The third portion consists in applying a reflector of silvered metal, glass, or other suitable material underneath the burners of gas-stoves constructed according to this invention.

4563.—Van der Kelen, L., Brussels, "*Improvements in gas-stoves.*" Patent dated Nov. 25, 1876.

This stove consists of a cylindrical external casing slightly tapering towards the upper part, which encloses an inner cylinder of an inverted conical form, the lower part sloping down rapidly so as to form a suitable surface for the gas-flame to impinge upon. The upper part of the inner cylinder terminates in a flange, which enters a hollow rim below the cover of the stove, and contains sand for the purpose of sealing the joint. The lower part of the inner cylinder terminates in a tube, which is carried away under the floor, and may be used for conveying heated air to another apartment or for introducing fresh air from without.

The burner which forms the heater is, by preference, of a double concentric form and the gas is conveyed thereto by duplicate pipes, so that one or both burners may be used according to the heat required. A certain proportion of air is allowed to flow in with the gas, so as to obtain the maximum of heat therefrom.

Between the inner and outer cylinders there is arranged a spiral screw or inclined plane, the object of which is to absorb all the heat from the gas, and impart it to the external casing. At the upper part of the outer casing is a lateral outlet, which carries away all injurious products of combustion. A door is fitted in front of the stove, so as to afford ready means of lighting the burners.

4576.—Mathieson, C. F., Mincing Lane, London, "*Improvements in the manufacture of gas.*" Patent dated Nov. 25, 1876.

This invention has for its object improvements in the manufacture of illuminating coal gas, and in carrying it into effect the fire-clay retorts are placed horizontally one over another, and so closely that they are in direct contact at the mouth, and the narrow space of about one inch between the respective bodies of the retorts is filled up with a layer of fire-bricks 4½ inches wide. The lowest retort is coupled with the middle retort, at the mouth outside the bench, by a cast-iron circular tube about 6 inches long, and of an internal diameter of at least 8 inches. The middle retort is coupled with the upper retort, within the bench at the back, by a round hole in each of about 15 inches diameter, and to correspond or match exactly, and joined by thin fire-bricks properly cemented with fire-clay to render the connection gas-tight. The outlet is from the mouth of the uppermost retort, and formed of cast iron of an internal diameter of at least 10 inches. Within and on the bottom of this uppermost retort, at the edge of the round hole, is formed a short and level fire-clay wall, of a height sufficient to prevent the coal encroaching on the rear passage from the middle retort.

In charging the retorts, a half cylinder scoop is provided, with a steel bar of about 3-16ths of an inch thickness, rivetted across the open end to connect both sides, and rising from each side in a convex line about 2 inches, but quite level in the central part. When the labourers have turned the scoop, the charge of coal is deposited in the retort in a long ridge of irregular elevation; they have then to carefully withdraw the scoop over that ridge, and when about half the length is outside, the handle end should be depressed until the scoop is entirely withdrawn. This bar spreads and levels the discharge of coal evenly over the bottom of the retort, and the timely depression of the handle end of the scoop prevents the removal to the mouth of the retort of any large pieces of coal there may be in the charge.

The thickness of the charged layer of coal, in retorts of about 8 feet 6 inches to 9 feet length by 16 inches and 20 inches internal diameter, ⌂ shape, should not exceed 5 inches, in order to admit of perfect distillation of the charge, and with such a charge the distillation is completed in about two-thirds of the usual time now employed. By the observance of this arrangement the product of good gas in each bench during 24 hours is immensely increased (more than three charges being added), and much fuel saved, while one-third of the retort benches and apparatus is dispensed with, besides the proportionate labourage and renewal of retorts and apparatus.

The production of pure gas and its free passage are also much facili-

tated. During the distillation the use of an adequate exhauster is indispensable, and the dip-pipe should be adjusted at about half an inch dip into the hydraulic main, which ought to be at least 3 feet from the top of the retort-bench.

The operation of charging the retorts begins at the uppermost, continuing with the middle, and terminating with the lowest in rapid succession; and one set in the bench having been charged, the second set of retorts is treated in the same manner after an interval of about one hour and a half. The result of this interval is a better mixture of all the gas, and an equal temperature of the retorts. If the retort-bench contains seven retorts, the charging of the seventh is performed immediately after that of one set of three.

In order to secure the collective advantages from the enumerated improvements, it is necessary to observe the following rules, invariably practised by well-organized gas-works:—The careful maintenance of an equal temperature during distillation by a small supply of fuel every 15 minutes; the cleaning of the apparatus once each month; and the avoidance of the use of coals which are very moist or in too large pieces.

4613.—Young, W., Clippens, N.B., "*Improvements in the manufacture of illuminating gas.*" Provisional protection only obtained. Dated Nov. 29, 1876.

This invention relates to improvements in the manufacture of illuminating gas, and consists—first, in producing or inducing the decomposition or destructive distillation of the coal, shale, hydrocarbon oil, or other substance used for the production of gas, by causing a rapid agitation or circulation of the volatile products inside the retort or other distilling or decomposing vessel, either by means of mechanical pistons, or by the agency of jets of compressed gas, steam, or vapour, with the object of bringing about a more regular and equal decomposition, into permanent gas, of the elements of the coal or other substance, and, in some cases, in increasing the volume of gases by the decomposition of steam or vapours employed to produce the current, and also by blending, or combining, or carburetting the gases injected (to produce the currents) whilst in rapid agitation or circulation in contact with the products of decomposition.

Secondly, in improved means or methods of producing a rapid separation of those condensable hydrocarbons from the crude gases which it is desirable to remove in the liquid form, and at the same time retaining in the gases the vapours of the hydrocarbons, which are valuable for imparting to the gas a high illuminating power. This is accomplished by causing the gas to pass through narrow passages kept heated, these passages being preferably of a tortuous nature, causing the gas to impinge or flow alternately from side to side, or by causing the crude gases to impinge in narrow or minute streams against heated surfaces; or alternately the crude gases themselves may be first highly heated, and then passed through narrow passages, or impinged against surfaces whilst in this heated state.

4779.—Cherry, W. P., and C. E., Hull, "*Improvements in the manufacture of gas for illuminating and heating purposes, and in apparatus for the same; parts of which are applicable to other purposes.*" Provisional protection only obtained. Dated Dec. 11, 1876.

This invention consists, in the first place, of dissolving in water nitrate of soda or chlorate of potash, or other ingredient capable of giving off oxygen, so that when the water is boiled in a suitable apparatus, it will produce more oxygen in the steam than is contained in steam generated from water alone.

The second part of the invention consists of an arrangement of retorts or apparatus, whereby coal, peat, wood, coke, charcoal, or any carbonaceous substance is completely converted into gas by passing the oxygenated steam through the carbonaceous substances contained in the retorts, which are heated to a sufficiently high temperature.

The third part of the invention consists of an arrangement of hydraulic apparatus or air-tight chambers charged with water and benzoline, or petroleum spirit, through which the oxygenated steam, after passing through the carbonaceous substances contained in the retorts, passes to produce the required illuminating and heating gas.

The apparatus for producing the oxygenated steam consists of a boiler supplied with the dissolved nitrate of soda and water by any of the ordinary means. The boiler is heated by any means so as to produce steam. The retorts for holding the coal, peat, wood, coke, or other carbonaceous substances consist of one, two, or more, and are made of fire-clay or other suitable material, and made of a particular shape, so as to completely convert the contents into gas. The retorts are heated by fire suitably arranged. The hydraulic apparatus or air-tight chambers, which contain water and benzoline, or petroleum spirit, consist of a series of air-tight chambers fitted with a series of partitions and pipes for conducting the gas in and out of the water and benzoline, or petroleum spirit on its passage through the same. The hydraulic apparatus or air-tight chambers may be made of any shape desired, and provided with taps or valves, so as to charge the interior of the apparatus with water and benzoline, or petroleum spirit, and provided with taps or valves to let off the same when required.

When the above described apparatus has been connected together by means of pipes communicating one to the other, in order to produce the required illuminating and heating gas, the oxygenated steam from the boiler under pressure passes through the communicating-pipe to the retorts and through the contents of the same, and thence through the communicating-pipe and the hydraulic apparatus, and through the communicating-pipe to the gasholder or to the burner, to be consumed or otherwise.

4824.—Foulis, W., Glasgow, "*Improvements in drawing retorts, and in the machinery or apparatus employed therefor.*" Patent dated Dec. 13, 1876.

This invention, which relates to improvements in machinery or apparatus for drawing gas-retorts, consists in certain modifications of the invention for which Letters Patent (No. 59, A.D. 1873) were granted to the patentee.

The object of the present improvements is to enable a considerable reduction in the weight and dimensions of the drawing apparatus to be effected, at the same time to diminish the wear and tear of the apparatus and to reduce the quantity of water used, by virtue of a smaller sized hydraulic cylinder being under this arrangement sufficient. These objects are carried out by making the piston-rod of the hydraulic cylinder a fixture at one end of a parallel frame, or to one end of a bar, and provided at the opposite end with a piston, over which the hydraulic cylinder, which, under the present invention carries the rake, passes. The hydraulic cylinder is provided with rollers or their equivalent, for the purpose of guiding the cylinder, in its motion, parallel with the frame or bar. The piston-rod is tubular, and is provided with a second tube or passage, whereby, in connection with a reversing-valve, the water under pressure (by means of which the apparatus is operated) is admitted to alternate sides of the piston, and the cylinder with its rake is driven forwards into, and draws the charge out from, the retort. The drawing apparatus, with its frame or bar, is suspended at or near the centre, from a chain or its equivalent, so that its position may be adjusted as required.

4842.—Johnson, S., Wood Green, "*Improvements in gas-meters.*" Provisional protection only obtained. Dated Dec. 14, 1876.

This invention relates to wet meters, and has for its objects improved methods of constructing and arranging the parts of such meters.

In carrying out the invention it is proposed to take a cylindrical drum, or measuring vessel, of sheet metal or other suitable material, which is fixed upon a horizontal axis revolving in bearings formed upon, or attached to, an outer case or box, within which the measuring drum is contained. The drum has a part of its circumference (preferably about one-fourth, or 90°) removed, and the remaining part is divided into two equal chambers, by a radial internal division extending from the axis to the circumference. At the bottom of the outer case are arranged two pipes (or one pipe divided into two by a longitudinal division), which rise vertically into the interior of the measuring drum, passing through the latter where its circumference is removed, and being bent or curved laterally so as to escape the axis, and rise to a sufficient height into one of the two chambers into which the drum is divided. Two precisely similar pipes (or one pipe divided into two by a longitudinal division) are arranged side by side with those first described, and rise to the same height into the other of the two divisions into which the drum is divided.

By the method of construction and arrangement described, the drum cannot make a complete revolution, but can oscillate backward and forward to an extent limited by the extent of its circumference which is removed, as already described, and through which the pipes pass. The upper ends of the two pipes (or the divided pipe), which rise into each compartment of the drum, are provided with a slide valve capable of a certain amount of lateral travel, and the sizes of each valve, and of the opening in the pipes which it covers, are so proportioned that whilst only one of the pipes can be opened at once, each is opened alternately by moving the slide valve backward and forward. A horizontal sliding bar is provided, having teeth or lugs upon its edge, which are actuated by a toothed wheel or segment or lever fixed to the axis of the drum, so that when the latter is made to oscillate backward and forward, as already described, the sliding bar is also made to slide or travel simultaneously backward and forward; and at or near each end of the sliding bar, bars, pins, or levers are arranged, which strike or actuate the slide valves, and drive them backward and forward. These pins, bars, or levers only actuate the slide valves at the extreme ends of the stroke of the sliding bar (and of the oscillating drum), and upon the upper part of the drum; or upon a lever on its axis, is arranged an adjustable weight which aids the movement of the drum and of the sliding bar at the ends of their stroke. One of each of the pipes (or one division of each divided pipe), after it leaves the drum case, is connected with an inlet gas-pipe, and the other of each of the pipes (or the other division of each divided pipe) is connected with an outlet gas-pipe, and the drum-case and drum are filled with water.

The proper level of the water may be regulated by any of the methods well known and practised for the purpose in wet gas-meters; but it is preferred to adjust and maintain it by the following novel arrangements. An external chamber is made in communication with the drum-case of the meter, so that the water stands at the same level in each, and the bottom of this chamber is provided with a hollow screwed socket, into which is screwed a vertical pipe. The hollow socket outside the chamber is provided with a moveable water-tight cap, and the upper end of the vertical pipe is provided with a hole, square or of other suitable shape, to fit a key which is introduced through an opening in the top of the external chamber. By this means the pipe can be screwed up or down until its upper edge exactly coincides with the level of the water in the meter when the latter is indicating correctly, and any surplus water passes down the pipe, and can be removed by means of the moveable cap when required. When the pipe has been adjusted to its proper height, the opening in the top of the external chamber is closed by a plate or screw cap, which may be sealed so that it cannot be interfered with. An adjustable valve is provided, actuated by a float upon the surface of the water, and adjusted in such manner that if the level of the water falls too low the valve closes the inlet-pipe, and so shuts off the supply of gas from the meter until the proper level of the water has been restored by the addition of a fresh supply. This may be furnished by any of the methods ordinarily used and practised.

4917.—Gill, J., Bridgnorth, "*A new or improved gas-stove.*" Patent dated Dec. 20, 1876.

The body of the stove consists of a cast-iron box or frame, by preference of a square or rectangular figure, and having within it a smaller box or frame, the inner box or frame forming the stove proper, and the outer box or frame the case of the stove. The space between the two boxes or frames constitutes a non-conducting chamber entirely surrounding the sides of the inner box or stove proper. This chamber is filled, by preference, with some imperfect conductor of heat, such as sand, plaster of Paris, or other earthy material. In the middle of the bottom of the stove is an opening through which air passes to the inner chamber of the stove, and the top of the stove is covered by a perforated plate or lid, through which the hot air from the stove passes into the apartment to be heated. In the inner chamber of the stove is a horizontal circular burner provided with a series of jets. To this burner a mixture of ordinary coal gas and air is supplied, air entering the gas supply-pipe by openings in it outside the stove. Suspended from the under side of the perforated cover or lid of the stove is a perforated horizontal plate, which is situated a short distance above the circular burner. The jets of flame heat this suspended plate, which acts as a heat diffuser, and also prevents any dust passing through the perforated cover of the stove from choking the jets of the burner.

In using the stove described, it is placed by preference in the floor of the building or apartment to be heated, the perforated cover being situated on a level with the floor. The outer case or box of the stove has on its exterior and near its top an overhanging shoulder or flange, by means of which the stove is supported upon the joists of the floor. When the stove is placed in the floor of the building or apartment, the non-conducting chamber of the stove keeps the external box or case so cool that the heating of the floor of the room is effectually prevented. Instead of placing the stove in the floor of the building or apartment, it may be supported on the floor by a stand.

4967.—Storer, J., and Pugh, C. H., Stafford, "*Improvements in retort-lid fastenings.*" Patent dated Dec. 23, 1876.

This invention has for its object the securing of the luted lids to the mouthpieces of retorts with ease and despatch, and consists in the employment of lugs attached to the mouthpiece in the ordinary way. To one of these lugs is hinged the cross bar, the other end of the bar falling into a catch on the opposite lug. At or near the centre of the cross bar rises a vertical pin, and through the thickness of the cross bar there is a horizontal slot in the direction of the axis of the retort. Through this slot a short bar, having a flange or collar at one end, and a vertical pin at the other, is made to slide.

To make the apparatus complete, a handle or lever having a hole near one extremity, and a curvilinear slot eccentric to the hole, is provided, and when placed in position the hole in the handle receives the pin or fulcrum fixed to the cross bar, while the slot receives the pin fastened to the sliding bar. The pin attached to the sliding bar may be adjustable.

The action of the apparatus is as follows:—The lid having been placed against the retort, the cross bar is thrown over till it bears on and takes

into the catch on the opposite lug, when by thrusting the lever or handle towards the retort, the pin which works in the eccentric slot, and, consequently, the sliding bar, is pushed forward until the flanged end of the bar touches the lid, and produces sufficient pressure thereon to form a tight joint between it and the mouthpiece. A reverse movement of the handle releases the lid from pressure, and it may be removed with facility.

5013.—KENNEDY, T., N.B., Kilmarnock, "*Improvements in water-meters.*" Patent dated Dec. 28, 1876.

This invention relates to water-meters of the positive and reciprocating class, such as that known as "Kennedy's," and comprises various improvements in details, having for their object to render the meter less liable to derangement. They relate more particularly to the four-way cock or valve by which the water is directed alternately to and from opposite ends of the cylinder or measuring chamber, and to parts immediately connected with this cock.

The stroke of the tumbling-weight, which, in the Kennedy meter, effects the shift of the valve or cock, in acting on either arm of the lever fixed on the cock spindle, has a tendency to move the cock plug on end, and the larger end of the plug having hitherto been towards the lever, the action has tended to jam the plug. By the present invention the smaller end of the valve plug is put towards or nearest to the lever, so that the end-way action tends to relieve the plug; and the plug, instead of being made with the usual slight taper, is made with a conical surface forming an angle of at least 30° of the circle with the axis, or it may be made flat, or of any angle between 30° and 90°. The cock plug is pressed into its seat, firmly but not rigidly, by a spring applied to its spindle or centre, the spring consisting, by preference, of a piece of vulcanized rubber faced with vulcanite. The spring is inserted in a small socket formed on the inside of a cover, which closes the opening by which the cock plug and its seating are entered into their places. The cock plug is, by preference, of brass or bronze, and its seating is of brass, or vulcanite, or lignum vitæ, and the cock plug is balanced, or nearly so, as regards lateral pressure due to any difference of pressure on the inlet and outlet sides of it, by having blank ports or slight recesses formed in its surface near its larger end, these ports being put in communication respectively by grooves with the opposite through-ways. The plug spindle passes out through a stuffing-box in the usual way, and has the two-armed lever fixed on it externally.

5035.—PAGE, W., Newcastle-on-Tyne, "*Improvements in valves, taps, or cocks.*" Patent dated Dec. 29, 1876.

This invention relates to valves, taps, or cocks for steam, water, or other fluid, in which the passage is an open way when the closing details are open. The closing details are moved across the line of the way or passage, and generally in a vertical direction, a valve chamber being formed for them on a short pipe piece made with faucet or other ends for connection in a line of piping, and they are moved by means of one or two plain or screwed spindles passed through stuffing-boxes in the outer end of the valve chamber.

Amongst the improved details are comprised two pieces which act as partners, and one of which is a valve-plate, shaped and fitted to close tightly against a valve seat, whilst the other is a partner plate or frame, which may be fitted to close tightly against a second seat facing the other one, or which, without acting as a valve, may simply move across the passage so as to keep opposite, or nearly opposite, to the valve-plate, and serve for closing and tightening the latter. A ball or spherically surfaced piece is interposed between the valve-plate and the partner plate, and, in consequence of the peculiar configuration of the parts, causes the valve-plate to be tightly forced against its seat by a movement which the partner plate has in excess of the valve-plate after the latter has reached its closing position. On opening the valve the jamming pressure is relieved prior to moving the valve-plate from over its seat. By the use of the ball or spherically surfaced piece the valve-plate is rendered free to turn on its centre, and it is made to encounter a stationary frictional surface when closing, so as to be turned a little every time in order that the wear on it may be equalized all round.

97.—COLLINGE, T. A., and PATERSON, T. O., Rochdale, "*Improvements in the production of material for and method of purifying coal gas, and in apparatus used for that purpose.*" Patent dated Jan. 9, 1877.

This invention has for its objects the production of an improved liquid material for purifying coal gas; an improved method in so far as the gas is subjected to a less quantity of liquid, thereby preventing the liability to lose some of the hydrocarbons upon which the illuminating power of the gas depends; and an improved apparatus for the manufacture of the said material.

The invention has reference, in the first place, to what is known as desulphuretting gas liquor—that is to say, the driving off or expulsion of the sulphuretted hydrogen and carbonic acid from the gas liquor as it ordinarily comes from the hydraulic main, condensers, or other apparatus used in the manufacture of gas.

This driving off or expulsion is effected by the use of the following process and apparatus:—Gas liquor is allowed to flow into the top of a scrubber partially filled with coke, wooden boards, or other suitable material. The liquor falls down and runs away, by means of a pipe furnished with a stop-cock, and attached near the bottom of the scrubber, into a boiler set over a furnace. To the top of the scrubber is attached a pipe which leads to a purifier charged with oxide of iron or other suitable purifying material, or to a furnace. The liquor in the boiler is heated to about 180° Fahr. This causes the separation of the sulphuretted hydrogen and carbonic acid, together with a portion of ammonia from the liquor. The gases so disengaged pass up either the same pipe by which the liquor flows into the boiler or by a separate one; in either case, however, the gases are introduced near the bottom of the scrubber, and ascend against the current of liquor falling from above, and find an exit from the top of the scrubber by the pipe which leads the gases to the purifier or furnace before mentioned. The ammonia is, however, arrested by the falling liquor in the scrubber, and is returned to the boiler.

The process of desulphuretting the liquor, as just described, is not new, and is not, therefore, claimed as part of this invention, although the apparatus by which it is effected is somewhat simplified. Instead, however, of using the liquor so desulphuretted for the purification of gas, the following is adopted:—The boiler is made of the still shape—that is to say, with a still-head or its equivalent—and is furnished with a descending pipe, which is continued in the form of a coil or zig-zag arranged within a tank into which cold water is admitted, and continues to flow. From the end of the pipe in the tank is another which leads to a concentrated liquor store, vat, or tank. At or near where the pipe joins the still-head a valve is inserted, and at or near the bottom of the boiler is a pipe for conveying away weak liquor.

The liquor having been admitted to the boiler until nearly full, and desulphuretted as before described, is treated as follows:—The flow of liquor from the scrubber is stopped by shutting off the cock attached to the pipe leading from the scrubber to the boiler, and the valve in the neck of the still-head is opened. The temperature is then raised to boiling, and continued until the whole or nearly the whole of the ammonia contained in the liquor is driven off, together with some vapour of water, and condensed by the cooler before mentioned; the result being a highly caustic solution of ammonia, which is run off into the store vat before alluded to. The refuse or weak liquor remaining in the boiler may now be run off, and used to wash the gas which has been previously subjected to the caustic ammonia, so as to wash out any ammonia that the gas may have absorbed from the caustic liquor, and for this purpose it is preferable to water, since it is less liable to affect the hydrocarbons; or the weak liquor may be otherwise disposed of as discretion may dictate. The still-head valve being shut, and the liquor supply-cock opened, the desulphuretting process may again be proceeded with.

The solution of caustic ammonia, made as described, being comparatively pure, may be used with great advantage in the purification of gas from both sulphuretted hydrogen, sulphur compounds, and carbonic acid, by submitting the gas to its action, either in scrubbers, washers, or other suitable vessels, and from its being used in a concentrated form, the gas is not so likely to have its hydrocarbons absorbed as when a greater quantity of weaker liquid is employed for the same purpose. By the use of such concentrated liquor also smaller purifiers may be used, thereby effecting an economy in expenditure on plant, together with a reduction in the quantity of purifying material subsequently employed.

It is not absolutely necessary that the boiler used for desulphuretting should also be used as the still for concentrating the liquor, as the liquor may be run off from the boiler to a separate still; but on the ground of economy it is preferable to use the same apparatus for both purposes.

The vessel used for desulphuretting the liquor may be so arranged that the temperature may be kept up by the exhaust steam produced on the works being made to travel through a series of pipes immersed in the liquor, while steam from a special boiler may be injected into the liquor, whenever the boiling or distillation is necessary.

121.—DRONIER, P., Paris, "*Improved means for lighting gas by electricity.*" Provisional protection only obtained. Dated Jan. 10, 1877.

This invention consists in a means of lighting gas-burners, either separately or simultaneously, by bringing the gas coming from the burners in contact with a platinum wire heated to red heat by means of electricity in any suitable manner.

To prevent any alteration in the platinum wire, it is so placed that the heat of the flame shall not be sufficient to exercise its action upon it; or it is removed away from the flame as soon as the lighting has taken place. Arranged near the burner is a tube containing the wires conducting the electricity, and which can partly turn on an axis in such a manner that this movement opens the tap or cock, establishes contact, and draws the platinum wire opposite the current of gas. The opposite movement breaks the contact, and draws back the platinum wire to its normal position. There is placed on or near the burners one or several electro-magnets for drawing the platinum wire, at the moment of lighting, opposite the burner, by the effect of a derivation of the electric current employed for lighting.

For lighting street-lamps without opening them, a rod or pole is employed, provided with a portable battery acting on a moveable platinum wire placed in the lamp, and brought momentarily in the currents of gas just when the rod carrying the battery opens the cock and establishes the contact. The platinum wire is provided with two supports which pass through an insulator which is incombustible, such as bone or ivory, or into a metallic piece, from which they are isolated by means of a suitable insulating and incombustible material, such as mica.

169.—TONGUE, J. G., Southampton Buildings, London, "*Improvements in means and processes for obtaining colouring matters from cannel, anthracite, and other coals, applicable to various useful purposes.*" A communication. Provisional protection only obtained. Dated Jan. 12, 1877.

According to this invention, fossil coal or cannel coal, or anthracite or Boghead coal, are treated advantageously in fine powder with oxidizing chemical compounds by ordinary or higher temperatures in suitable vessels. The most advantageous method of carrying out these improvements is to heat the different coals, finely powdered with nitric acid or with potassic or sodic nitrate and sulphuric acid. Also potassic chlorate or potassic chromate, or hypochloride of lime or compounds of manganese, may be used for the reaction with or without an acid.

By this method of decomposition, the salts of strontium, of barium, of magnesia, of aluminium, of manganese, of iron, of cobalt, of nickel, of zinc, of cadmium, of lead, of tin, of copper, and of chromic oxide are obtained. All these bodies are black, or black brown, or brown colours, which may be mixed with other colouring matters. They can be used for painting, printing, and colouring. These colours are obtained as precipitates, and can be purified by water.

The alkali solution can also be decomposed by soluble metallic salts, and used by the dyer.

The alkali solution can also be decomposed by acids. A black brown precipitate is obtained, which may be washed in water, and which may also be used as a colouring matter. This black precipitate is the acid in which the coals are partly converted by the treatment with oxidizing compounds.

By the above described means fossil coal is oxidized, and the black residue obtained by the decomposition of the oxidized fossil coal may be applied as a colouring matter to various useful purposes.

196.—GIROUD, H., Paris, "*Improvements in rheometric regulators for gas-burners.*" Patent dated Jan. 15, 1877.

These improvements relate to the construction of gas-regulators described in the specifications to former patents, Nos. 315, of 1870, and 1953, of 1872.

According to the present improvements, the disc is fixed to an annular slide or sleeve, which slides upon a tube projecting downwards from the outlet orifice, and closed at its lower end. There is a slit at the upper part of the tube, through which the gas in the casing above the disc passes into the interior of the tube and thence to the burner. On an increase of pressure occurring, the disc, with its sleeve, is raised more or less, and is thus caused to close the slit to a greater or less extent. There is a space formed in the casing at the side of the chamber, in which the disc is situated, a hole being formed in the partition, so that the gas which enters the space from the inlet can pass into the chamber through the hole above the disc, as well as through the annular space between the disc and the chamber. The size of the hole, and consequently of the passage of the gas through it, is regulated by advancing a screw plug, screwing through a neck in the side of the casing, more or less towards or into the hole. The outer end of the neck is closed by a screw cap.

234.—LOW, W., Birmingham, "*Certain improvements in taps or cocks for steam, water, or other similar purposes.*" Provisional protection only obtained. Dated Jan. 18, 1877.

This invention consists in the construction of a tap or cock upon the anti-friction or anti-packing principle, and the object of the invention is obtained by employing a tapered plug working in a solid bottomed barrel, and kept in its place by a recessed cover. Upon the upper part of the tapered plug is an incline, and this traverses up a corresponding incline on the cover; thus, with the action in one direction, the tap is secure or tight when desirous of shutting off, but with a contrary action it is

released or turned on. In the interior of the cover is placed an india-rubber washer in the form of hydraulic packing, which tightens itself when pressure is applied, or a solid india-rubber washer may be employed bearing upon the top of the tapered plug, keeping it in its place, also tightening the spindle.

259.—Tassie, P., Manchester, "*Improvements in the means or arrangements for closing the mouthpieces of gas-retorts, and in tools for applying the same.*" Patent dated Jan. 20, 1877.

This invention consists in making the joint between the face of the lid and mouthpiece of the retort by applying a steel ring of circular cross section, which can be readily renewed, the ring being pressed into a groove formed in the edge of the mouthpiece. The groove is under-cut on its outside edge, so that the ring, being slightly elastic, is easily pressed in and held therein, the under-cutting allowing also for all differences of expansion between the steel ring and the cast-iron mouthpiece. The ring may be solid; but it is preferred to make it of wire of the exact length, bent to the form required, the two ends simply abutting against each other; also to make the lid of ordinary concave form on its inner face, having a boss in its centre, with a square hole in it to fit the square end of a screw, which screws through a cross-bar hinged to one side of the mouthpiece. The cross-bar is turned on its hinge until the lid is brought against the face of the mouthpiece, and the free end of the cross-bar then latches on a hook or catch secured in the side of the mouthpiece. The screw is then rotated, and with it the lid, and this brings the lid close up against the steel ring, and makes the joint tight. The lid may be cast iron, chilled on the edges; and there may be a stud in the lid to limit the amount of back-motion in the screw, and help to unlatch the cross-bar when the retort is to be opened.

The invention also relates to tools to be employed for cutting the groove for the steel rings and facing the mouthpieces of retorts, both for new rings and when rings require replacing, and for other facing purposes. The mechanism will be useful, both when the mouthpieces are moveable, and when they are in the position in which they are used, and it consists in a combination and arrangement of mechanism—namely, of a T-edged disc, or a pulley, or a disc, or its equivalent, and adjustable brackets, with a stem perpendicular to the disc. The disc is secured, or its adjustable brackets are secured centrally by set-screws in the T-flange or adjustable brackets into the mouthpiece of the retort. Upon the stem there is a boss, which can rotate round the stem, this boss having an arm upon it that carries a compound tool slide, with screws for moving them, one slide moveable at a right angle to the other, the upper slide carrying the cutting or turning tool. To the front of the stem an arm is secured by a bolt, which also forms an axis for a crank hand-wheel, upon a boss of which there is a spur pinion that gears with a spur-wheel upon a short shaft having bearings in the arm, upon the end of which short shaft there is a pinion that gears with a wheel secured to the boss carrying the compound slides, which is thus rotated. The fixed arm carries an adjustable finger or fingers, which will act upon the screws for self-acting the slides when required. The mechanism may be driven by steam or other motive power, if required.

351.—Harrison, C. W., Mansion House Chambers, London, "*Improvements in apparatus for charging or impregnating atmospheric air with inflammable vapours.*" Provisional protection only obtained. Dated Jan. 27, 1877.

This invention relates, firstly, to a new form of construction of generator; which is made of a shallow enclosed box of rectangular or other suitable form, and constructed of copper, tin plate, or other suitable material. Internally it is provided with parallel vertical partitions joining the top and bottom plates, and alternately one or other of the sides of the box.

The invention relates, secondly, to an improved form or construction of blower for forcing the air through generators; which is made of a collapsible vessel of cylindrical or other form, the top and bottom of which are of wood, metal, or other suitable rigid substance, and the sides of any suitable flexible air-tight material. A valve, or valves are provided, opening inwards from the atmosphere when the ends are drawn apart, by which means the vessel is filled with air; and on pressing the ends together, by a weight on the top, the valves closes, and the air contained in the vessel is forced through a second valve opening outwards, through a pipe communicating with the generator, at a velocity proportionate to the pressure applied to the collapsible vessel, which pressure may be adjusted to suit the number of burners to be supplied with the inflammable gas or fluid.

413.—Hunt, B., Serle Street, London, "*Improvements in pipe-joints.*" (A communication.) Patent dated Jan. 31, 1877.

The object of this invention is to effect a practical and economical jointing of pipes used for conveying water, gas, compressed air, and other fluids, so as to make a perfectly tight joint. It consists in the use, in combination, of clamps having internal beads; also in the use, in combination, of clamps having internal beads, also in the combination of clamps having internal beads and projections and recesses on their ears; and in the use, in combination, of clamps having internal beads, and formed with or without projections and recesses on their ears, and with an internal recess, with suitable packing, in jointing cylindrical adjacent ends of pipes provided with exterior end beads.

## APPLICATIONS FOR LETTERS PATENT.

2239.—Allan, W., Kilburnie, N.B., "Improvements in and connected with mine and other pumps." A communication. June 5, 1878.

2278.—Boulton, M. P. W., Tew Park, Oxford, "Improvements in gas motor engines." June 7, 1878.

2281.—Siemens, C. W., Westminster, "Improved means and apparatus for distributing and regulating electric currents to work lamps and other electric apparatus." June 7, 1878.

2285.—Vacherot, A., Battersea, London, "Improvements in rotary engines, rotary pumps, and other like apparatus." June 7, 1878.

2299.—Haddan, H. J., Westminster, "Improvements in gas-burners." A communication. June 8, 1878.

2350.—Abel, C. D., Southampton Buildings, London, "An improved manufacture of combustible gas for illuminating and heating purposes, and apparatus and lamps employed for that purpose." A communication. June 13, 1878.

## PATENTS WHICH HAVE PASSED THE GREAT SEAL.

4768.—Pearn, F. and S., Manchester, "Improvements in valves for pumping water, air, and other fluids." Dec. 15, 1877.

4865.—Silbermann, A., Berlin, "Improvements in gas blow-pipe machines." Dec. 21, 1877.

4919.—Wilson, J. G., Manchester, "Improvements in and apparatus for carburetting gas to increase its illuminating properties." A communication. Dec. 28, 1877.

92.—East, W., Kingston-on-Thames, Surrey, "Improvements in the treatment of sewage and other waters, for the purpose of purifying the same." Jan. 7, 1878.

1006.—Bernays, A. J., Lambeth, London, "Improvements in filters for purifying water." March 13, 1878.

1092.—Morgan-Brown, W., Southampton Buildings, London, "Improvements in fluid-meters." A communication. March 19, 1878.

1267.—Cliff, W. D., Wortley, Yorks, "Improvements in the manufacture of furnaces for gas and other works." March 30, 1878.

## PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1895.—Hills, F. C., "Improvements in the purification of gas, and in the preparation of materials to be used in the said purification." May 24, 1875.

1953.—Jones, F. C., "Improvements in supplying and regulating the supply of water by means of a self-acting apparatus, for urinals and other purposes." May 28, 1875.

1994.—Brookes, W., "Improvements in means or apparatus for conducting and controlling the flow or passage of water, gas, or other fluids or vapours." June 1, 1875.

2000.—Schüssler, C. F., "Improvements in hydrocarbon gas apparatuses." June 1, 1875.

2016.—Bruce, de V., and Antisell, T. M., "An improved engine for utilizing the expansive force of vapours or gases, either by gradual pressure or explosion." June 2, 1875.

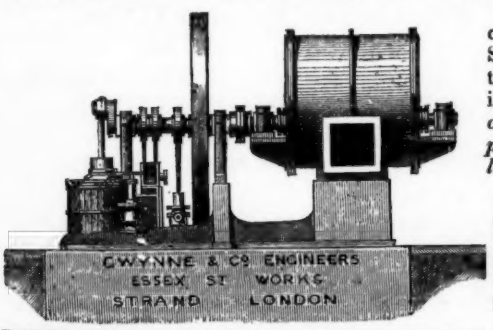
2030.—Dykes, W., and Scott, J., "Improvements in taps or valves for controlling the flow of liquids or fluids." June 2, 1875.

2067.—Key, W., "Improvements in station gas-governors." June 5, 1875.

2076.—Wood, R. J., "Improvements in retorts, furnaces, and other close heating vessels or chambers." June 5, 1875.

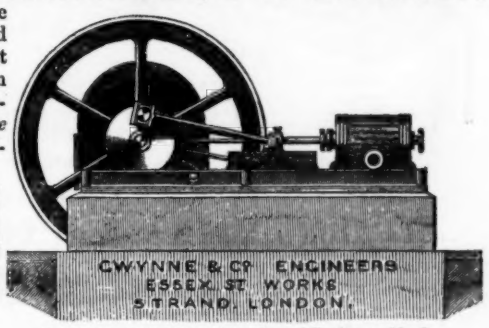

**The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.**

# GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.




The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.




EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

**Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.**

**PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**

*Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.*

**WANTED, by the Middleton and Tonge Improvement Commissioners,** a person well qualified to SUPERINTEND and MANAGE thoroughly the GAS-WORKS. He will be required to devote the whole of his time to the duties of the Office. Salary to commence at £160 per annum.

Applications, with testimonials, addressed to the Chairman of the Gas Committee, to be delivered at my Office, on or before Monday, the 24th inst., not later than six o'clock in the evening, endorsed, "Application for the Situation of Gas Manager."

FREDERICK ENTWISTLE,
Clerk to the said Commissioners.

Commissioners Rooms, Gas Street, Tonge,
Middleton, near Manchester, June 7, 1878.

---

**A Gas Manager, presently in charge of** Gas-Works in Scotland, is desirous of having charge of Works abroad. Trained in the Accountant and Working Departments.

Address No. 467, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

---

**A Young Man, aged 22, who has just** finished a four years engagement with a provincial Gas Company is open to take a situation as Manager of small Gas-Works, or as Assistant to the Engineer of large Works. Can give first-class testimonials. Has no objection to go abroad.

Address No. 460, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

---

**WANTED, by a Young Man, aged 22,** who has had five years experience in a Provincial Works (make, 75 millions), a SITUATION in a Gas-Works. Can use Photometer, fair Draughtsman, good Writer, quick at figures, and thoroughly understands general routine.

Apply S. I. C. E., 54, Hardress Street, RAMSGATE.

---

**WANTED, to invest from £5000 to** £20,000 in the PURCHASE of Gas-Works.

Apply, by letter only, with full particulars, to No. 466, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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**WANTED, by a Gentleman, aged 29, a** Situation as MANAGER of a Gas-Works on the Continent or abroad. Advertiser has been about seven years in present situation as Engineer and Manager, where the make of gas is about 150 million cubic feet.

Thoroughly understands the erection of works, also the manufacture and distribution of gas in all its branches. Speaks French and Italian. Can leave present situation immediately. Excellent testimonials.

Address C. E., care of Messrs. Dawson and Sons, Cannon Street, LONDON.

---

**WANTED, by Samuel Thompson & Co.,** Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

---

**WANTED, Orders for Samples to test** the superior Silkstone, Wigan, and other Gas Coals and Cannel on Sale by G. J. EVESON, Gas Coal and Cannel Contractor, BIRMINGHAM.

N.B.—Prices on personal application, or by post or telegram, on shortest notice, and prompt delivery.

---

**NOTICE TO MANAGERS OF GAS COMPANIES.**

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to

FRANK M'GEDY, Secretary.

126, Chancery Lane, London.

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BUENOS AYRES GAS COMPANY, LIMITED,
SIX PER CENT. DEBENTURES.

**NOTICE is hereby given to the Debenture** Holders of the Buenos Ayres Gas Company, Limited, that the Half-Yearly Coupons, at the rate of six per cent. per annum, due on the 1st of July next, will be paid on and after that date at the Company's Bankers, Messrs. Prescott and Co., Threadneedle Street, London.

Coupons must be left at the Bank three clear days for examination.

By order,
E. W. LAYTON, Secretary.

1, East India Avenue, Leadenhall Street.

---

**WANTED, Readers of the Pamphlet,** "Cooking and Heating by Gas; on Burners," &c.

Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.

---

**CARBON.—For Sale, at the Wrexham** Gas-Works, about 20 Tons of RETORT CARBON.

Tenders to be sent to the MANAGER.

---

**FOR SALE, by the Swindon Gas and** Coke Company, Swindon, Wilts, an old TELESCOPIC GASHOLDER, 30 ft. 6 in. diameter by 16 ft. deep, with four cast-iron Columns 17 ft. long, and Tie Bars; also the Bricks forming the Tank for the same. To be removed by and at the expense of the purchaser.

Tenders to be forwarded to the Secretary on or before the 1st of July, 1878.

The Company do not bind themselves to accept the highest or any tender.

HENRY HUNT, Secretary.

---

**TWO Purifiers, 6 ft. by 4 ft., 6-in. Valves** and Connections, with Lifting Apparatus and Girders complete; also a Set of Twelve Pipe Condensers, all in working order, to be SOLD, a bargain.

Apply to Manager, Gas-Works, ENFIELD.

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**ON SALE—A Station-Meter (with new** Drum), capable of passing 10,000 cubic feet per hour, with Hydraulic Valves, Bye-Pass, &c.; 10-in. Connections. Has been removed to make room for one of larger capacity.

For particulars and price, apply to GEORGE NEWTON, Gas-Meter Manufacturer, Union Street West, OLDHAM.

---

RIPON CORPORATION GAS-WORKS.

**EXHAUSTER for Sale (by Dempster),** with Engine, Bye-pass Valve, and Governor complete, capable of passing 3000 cubic feet per hour. Has been five years at work, and is in good repair, being sold to make room for a larger one.

Apply to GEO. IRVINE, Gas-Works, RIPON.

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**YEO'S PATENT ENGINE PACKING,**

Price 1s. 8d. per lb., any size.

Tarred & White Spun Yarn for Pipe Joints, at various prices.

Samples and testimonials free per post.

E. YEO, NEWTON ABBOT.

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PURIFIERS WANTED.

**TWO Purifiers, 5 ft. square by 2 ft. 6 in.** deep, with Wood Grids or Sieves, and Dry Centre-Valve for four Purifiers; 5 in. Connections, with Connection and Covers complete.

Tenders to be received previous to meeting of the Board on the 1st of July next by

WILLIAM KELLY, Clerk to the Commissioners.

Athlone, June 8, 1878.

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GAS TAR AND AMMONIACAL LIQUOR.

**WANTED, Tenders for the above pro-** ducts, or either of them, for One or more years, from the 1st of July next. Quantity, about 10,000 Gallons of each per annum.

Tenders to be sent on or before the 21st of June to the undersigned, who will give any further information.

JOHN PATTINSON.

Gas-Works, Cockermouth.

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TO IRONFOUNDERS.

**THE Gas Committee of the Buxton Local** Board invite TENDERS for the Supply of about 1680 Yards of 12-in. Turned and Bored Cast-Iron PIPES.

Specification and forms of tender to be had of Mr. G. Smedley, Gas-Works, Buxton.

Tenders, endorsed "Gas-Pipes," addressed to the Chairman, must be sent in on or before Monday, the 24th inst.

JOSIAH TAYLOR, Clerk to the Board.

Buxton, June 6, 1878.

---

LONGFORD GAS COMPANY, LIMITED, IRELAND.

**THE Directors of the above Company are** prepared to receive TENDERS for the Supply of 350 Tons of Best GAS COAL, delivered free into railway waggons, at North Wall, Dublin. One-half to be delivered immediately, and the remainder in September.

Tenders must be sent in on or before Tuesday, the 25th inst.

WILLIAM KEDDIE, Secretary.

Gas-Works, Longford, June 11, 1878.

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CIRENCESTER GAS COMPANY, LIMITED.

**THE Directors are prepared to receive** TENDERS for 600 Tons of Real Old Silkstone GAS COAL, 600 Tons of Best Forest of Dean GAS COAL, and 300 Tons of Through Penygraig WELSH COAL, to be delivered at Cirencester Station during the next Twelve months, at such times and in such quantities as the Manager of the Gas-Works may direct. Also for the Purchase of the Company's COKE. The Contractor to remove the same as required by the Manager.

Tenders to be sent to J. BERCHAM, Secretary to the Gas Company, 76, Castle Street, CIRENCESTER, on or before the 1st of July.

---

TO MANUFACTURING CHEMISTS, &c.

**THE Directors of the Clayton, Allerton,** and Thornton Gas Company are prepared to receive TENDERS for the Purchase, at per Ton, of all the Surplus TAR and AMMONIACAL LIQUOR produced at their Gas-Works in Clayton, from July 1, 1878, to June 30, 1879. The Contractor to load and cart the said material at his own cost.

Sealed tenders, endorsed "Tender for Tar and Liquor," to be delivered, addressed to the Chairman at the Gas-Works, at or before noon on Saturday, the 29th of June inst.

The Directors do not pledge themselves to accept the highest or any tender.

By order,
JOHN NIVEN, Secretary and Engineer.

Gas Offices, Clayton, near Bradford,
Yorkshire, June 15, 1878.

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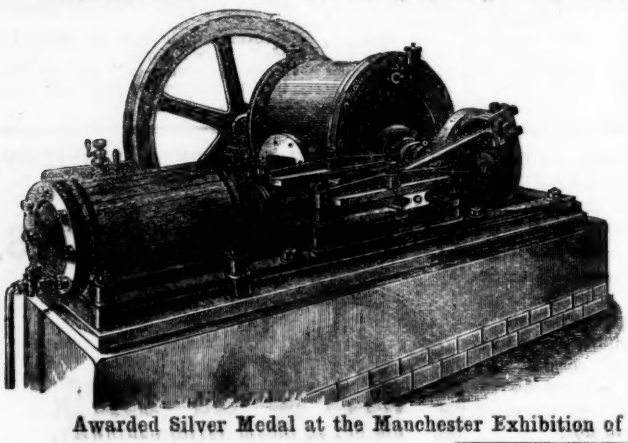
# BEALE'S IMPROVED PATENT GAS EXHAUSTERS

WITH

## Wrought-Iron Spindles and ENGINES COMBINED.



SOLE MAKERS,

**GEORGE WALLER & CO.**

**MAKERS OF ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.**

Awarded Silver Medal at the Manchester Exhibition of the Society for the Promotion of Scientific Industry.

Phœnix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

---

# TO GAS ENGINEERS.

## D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

**TAY WORKS. BONNINGTON, EDINBURGH.**

### OVER DARWEN LOCAL BOARD.

TO GAS ENGINEERS AND IRONFOUNDERS.

**THE above Board invite Tenders for** alterations to an existing SCRUBBER; also for one new Cast-Iron SCRUBBER, 50 ft. by 10 ft., with 16-inch Valves and Connections for both.

Particulars can be obtained, and plans and specifications seen, on application to the undersigned.

Tenders, endorsed "Tender for Scrubbers," to be addressed to C. Costeker, Esq., Law Clerk, Darwen, on or before the 1st of July next.

THOS. DUXBURY, Manager.

June 4, 1878.

### THE LLANDUDNO IMPROVEMENT ACTS, 1854 AND 1876.

TENDERS FOR GAS COAL.

**THE Llandudno Improvement Commis**sioners invite TENDERS for the Supply of GAS COALS.

The Tenders to be for One, Five, or Seven years, at the option of the Commissioners.

To be delivered in such quantities and at such periods as may be required.

The quantity required is estimated at about 1500 Tons per annum.

Parties tendering to give separate prices for Cannel Coal, Best Gas Coal, and Gas Coal and Cannel Mixture, delivered, carriage paid, at the London and North-Western Railway Station, Llandudno.

Sealed tenders, endorsed "Tender for Gas Coal," to be delivered to the undersigned, not later than by the morning postal delivery of Thursday, July 4 next.

The Commissioners do not bind themselves to accept the lowest or any tender.

THOMAS T. MARKS, C.E.,
Engineer and Clerk to the Commissioners.

June 15, 1878.

### MANCHESTER CORPORATION GAS-WORKS.

AMMONIACAL LIQUOR.

**THE Gas Committee of the Corporation** of Manchester are prepared to receive TENDERS for the Purchase of the AMMONIACAL LIQUOR to be produced at their Gaythorn and Rochdale Road Works during a period of One or more years, commencing from the 1st day of January, 1880.

In addition to tenders for the purchase of the Liquor in its crude state, the Committee will also be prepared to consider TENDERS for its DISPOSAL, either by manufacture into Sulphate of Ammonia at the above-mentioned Works on their behalf, or in any other manner.

The Committee reserve to themselves the option of accepting the offer, the terms of which they may deem most advantageous.

They do not bind themselves to accept the highest or any tender.

Sealed tenders, addressed to the Chairman of the Gas Committee, Town Hall, and endorsed "Tender for Ammoniacal Liquor," must be delivered at these Offices, on or before Thursday, the 1st day of August next.

Forms of tender and further particulars can be obtained on application to Mr. George B. Jackson, at the Gas Offices. By order of the Gas Committee,

JOSEPH HERON, Town Clerk.

Town Hall, Manchester, May 31, 1878.


**JOHN SPENCER,**

**VULCAN WORKS, WEST BROMWICH, & 97, CANNON ST., LONDON,**

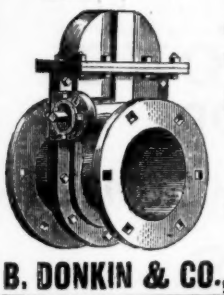
Manufacturer of Every Description of

**TUBES & FITTINGS,**

Plant, Tools, Stores, and all requisites for Gas and Water Works: Gasholders, Purifiers, Scrubbers, Roofing, Sashes, Retort Fittings, Grids, Socket-Pipes, Lamp-Posts, Wheelbarrows; Brasswork, Chandeliers, and Gas-Fitters Tools; Liquor-Pumps, Valves; Clay Retorts and Fire Goods, &c.

# B. DONKIN & CO.'S
# IMPROVED GAS-VALVES

WITH WROUGHT-IRON PINIONS.



List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.

These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.

In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.

ALSO SOLE MAKERS OF

J. BEALE'S NEW PATENT GAS EXHAUSTERS,

AND MAKERS OF

STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS,
VALVES FOR AMMONIACAL LIQUOR,
IMPROVED BRIDGE VALVES FOR REGULATING THE SEAL IN HYDRAULIC MAINS,
BYE-PASS VALVES, SCREW WATER-VALVES, &c.

**B. DONKIN & CO., 55a, BLUE ANCHOR ROAD, BERMONDSEY, LONDON, S.E**

# THE THAMES BANK IRON COMPANY,

(Successors to LYNCH WHITE,)

SUPPLY FROM STOCK

CAST-IRON RETORTS, SOCKET-PIPES for GAS or WATER PURPOSES, FLANGE-PIPES for STEAM, RAIN-WATER PIPES and GUTTERS, HOT-WATER PIPES and BOILERS, and all requisite Connexions for same; also LAMP-COLUMNS, LAMPS, WROUGHT FRAMES, WROUGHT-IRON TUBING, &c., &c.

*All kinds of Gas-Works Apparatus and General Castings made to Pattern or Drawing.*

ADDRESS—

**OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.**

TO GAS COMPANIES AND THE TRADE.

## J. DEFRIES & SONS,

MANUFACTURERS OF

**CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS VESTIBULE LAMPS, AND THE PATENT CRYSTAL ILLUMINATION.**

A LARGE STOCK ALWAYS IN HAND OF

IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,

AND EVERY DESCRIPTION OF

GAS AND WATER FITTINGS.

*THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS*

**STREET LAMPS AND COLUMNS IN GREAT VARIETY.**

WORKS: LONDON AND BIRMINGHAM.

**GAS MOONS,**
Cut and Engraved, of the newest designs

**GAS REFLECTORS**
In Silver and Glass

**GAS NIBS**
AND
**BURNERS**
Of every description.

Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1876, are now complete.

City Show-Rooms and Manufactory, 147, HOUNDSDITCH, LONDON.

ESTABLISHED 1830.


TO COLLIERY PROPRIETORS, COAL MERCHANTS, AND OTHERS.

**THE Directors of the Alton Gas and** Coke Company invite TENDERS for the Supply of 750 Tons of good Screened GAS COAL, to be delivered free on rail at Alton Station (L. & S. W. R.), in the following quantities:—

200 Tons during Sept., 1878.
200 „ „ Dec., 1878.
200 „ „ Feb., 1879.
150 „ „ Mar., 1879.

The Coal to be of good quality, and free from refuse; and parties tendering are requested to state from what district and pits it is obtained.

Terms of payment, cash.

Tenders to be sent in not later than Monday, July 1, 1878.

The Directors do not bind themselves to accept the lowest or any tender.

W. H. ELLIOTT, Secretary.

Alton, Hants, May 30, 1878.

TAR AND AMMONIACAL LIQUOR.

**THE Directors of the Wrexham Gaslight** Company invite TENDERS for the TAR and AMMONIACAL LIQUOR produced at their Works for One, Two, or Three years, commencing on the 1st of August next. Quantity produced about 200 Tons and 300 Tons respectively.

Further information may be obtained upon application to the undersigned, to whom tenders must be sent on or before the 1st of July next.

The Directors do not bind themselves to accept the highest or any other tender.

THOS. WALKER, Secretary and Manager.

Wrexham, June 12, 1878.

### BELFAST CORPORATION GAS-WORKS.

TENDERS FOR COAL.

**THE Gas Committee of the Belfast Cor**poration invite TENDERS for the Supply of 50,000 Tons of Best GAS COAL, to be delivered ex ship at Belfast, or at the Coal Wharf at the Gas-Works, during the year commencing in August next.

Tenders for less than 20 000 Tons will not be considered.

Parties tendering are also requested to quote prices for One Two, or Three years supply of 50,000 Tons each year.

Monthly quantities and further information may be had on application to the Manager at the Gas-Works.

Tenders, endorsed "Tender for Coal," must be received not later than July 3.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
SAMUEL BLACK, Town Clerk.

### MACCLESFIELD CORPORATION GAS-WORKS.

CANNEL AND COAL CONTRACTS.

**THE Gas Committee are prepared to** receive TENDERS for the Supply of the whole, or part of, 4000 Tons of CANNEL, and 6000 Tons of GAS COAL; the deliveries to extend to Two years, from the 1st of August ensuing, free at Macclesfield, and in such quantities as may be ordered by the Manager.

Tenders, specifying the description of Cannel or Coal, the pits at which they are to be raised, and the terms for net monthly payments, to be sent in not later than June 29, addressed to the Chairman, Gas Committee, Town Hall, Macclesfield.

The Committee do not bind themselves to accept the lowest or any tender.

THOMAS MOORE, Manager.

May 27, 1878.

### WIMBORNE (DORSET) GAS COMPANY.

PLANT FOR SALE.

**THE Directors of the Wimborne Minster** Gas and Coal Company, Limited, wish to DISPOSE of the whole of their present PLANT complete—consisting of a 7000 ft. Holder; one 6 ft. Square Purifier; two 5 ft. by 3 ft. ditto; Governor; 6 in. Condenser, with Tar Tank; Coke Scrubber, &c.—for which no reasonable offer will be refused.

Further particulars of Mr. G. THORNELOE, Engineer, 57, BARBICAN, E.C., or of Mr. GEORGE CHISLETT, Wimborne Minster, DORSET.

### RADCLIFFE AND PILKINGTON GAS COMPANY.

TAR AND AMMONIACAL LIQUOR CONTRACT.

**THE Directors of the above Company are** prepared to receive TENDERS for the Purchase of the TAR and AMMONIACAL LIQUOR made at their Works, Egerton Street, Sion Street, Radcliffe, for a period of One or Two years, commencing from the 1st day of August next.

Tenders must state the price which will be given per Ton for Tar or Ammoniacal Liquor, separately or together; the purchaser to provide barrels and cartage from the Works, and the Company to fill them on the Works.

The purchase to be paid for monthly.

Tenders to be sent to the Manager and Secretary not later than Thursday, July 4, 1878.

By order,
JOHN BRANDWOOD, Manager and Secretary.

Sion Street, Radcliffe, May 24, 1878.

### GAS COAL.

**THE MIRFIELD COAL COMPANY** are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of* 16·67 *candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON.

### THE BROUGHTON COAL COMPANY,

COLLIERIES, NEAR WREXHAM,

Are prepared to Supply their excellent GAS COAL on very favourable terms.

This Coal yields more than 10,000 cubic feet per Ton of gas of good quality, *in practical working on the large scale.*

A large purchaser reports the coke to be clear, of a quality rarely equalled in the retort-furnace, and much liked by the stokers.

**A PAMPHLET ON DIP-PIPES, &c.,** post free 6½d., on application to W. White, Gas-Works, Abersychan, Mon. See Reviews in the *Gas Trade Circular and Review*, March 29, 1878, and *Design and Work*, March 30, 1878.

**W. LIDDALL,**
**Public Accountant,**
**15, UNION COURT,**
**OLD BROAD STREET, E.C.**

**COMMERCIAL GLASS WORKS, 27, WELLCLOSE SQUARE, LONDON, E.**
**CHEAPEST HOUSE IN THE TRADE**
FOR
**GAS GLASSES OF EVERY DESCRIPTION.**

*Write for Lists, free on application to any part of the World.*

*Now Ready, price 28s., handsomely bound in Morocco, cloth sides, gilt edged and lettered,*

**THE FIRST VOLUME**
OF
# KING'S TREATISE
ON THE
**SCIENCE AND PRACTICE OF THE MANUFACTURE & DISTRIBUTION**
OF
# COAL GAS.

EDITED BY THOS. NEWBIGGING, C.E., M. Inst. C.E., AND W. T. FEWTRELL, F.C.S.

This Volume contains 460 pages of Letterpress, and is illustrated by 521 Woodcuts and 36 page and double-page Engravings, printed on Plate paper, and a full-page

**COLOURED ENGRAVING OF THE BECKTON GAS-WORKS,**
Forming a Frontispiece to the Volume.

ORDERS RECEIVED BY THE PUBLISHER,
WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

# EDWARD COCKEY & SONS,
## GAS ENGINEERS, FROME SELWOOD,
MANUFACTURERS OF ALL DESCRIPTIONS OF
# APPARATUS CONNECTED WITH GAS-WORKS.
THE ORIGINAL PATENTEES AND MANUFACTURERS OF THE
# DRY-FACED VALVES
FOR PURIFIERS, GASHOLDERS, BYE-PASS, AND OTHER ARRANGEMENTS REQUIRING VALVES IN GAS-WORKS.

The Faced Valves, as made by the Patentees, continue to give great satisfaction, and they are being used extensively by many of the best gas engineers of the day.

They are more easily repaired than any other kind of Valve in use, and can be re-ground in a few hours without removal, and made perfectly gas-tight.

References can be given to many Engineers of high standing, who will testify as to the favour in which they are held.

MANUFACTURERS ALSO OF SUPERIOR WOOD GRIDS FOR PURIFIERS, SCRUBBERS, &c.

# METALLIC OXIDE PAINT,

Specially adapted for painting Iron and Woodwork in and about **Gas-Works**, as it is not affected by the ammoniacal gases always present, but will keep its **Colour and Hardness** under the most trying circumstances; it forms a very hard surface, and effectually prevents iron from corroding; it will not crack or blister, and resists alike the heat of summer and the cold of winter.

Used extensively throughout Lancashire, Yorkshire, and neighbourhood. Among our customers are the following:—The Manchester and Salford Corporations the Gas Companies at Rochdale, Sowerby Bridge, Halifax, Stalybridge, Blackburn, Leigh, St. Helen's, &c.
Supplied mixed ready for use, or in stiff paste.

**J. E. WILLIAMS & CO., VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.**

1862.

# HALLETT'S
# PATENT ANTIMONY PAINT.

MADE ONLY BY

## GEORGE HALLETT & CO.,
**296, ROTHERHITHE, LONDON, S.E.**

CLASS II.

This Paint having been in general use over sixteen years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known. Its advantages are that—

It does not require DRIERS like other Paints.

It does not poison the painter like white lead. No colic by its use.

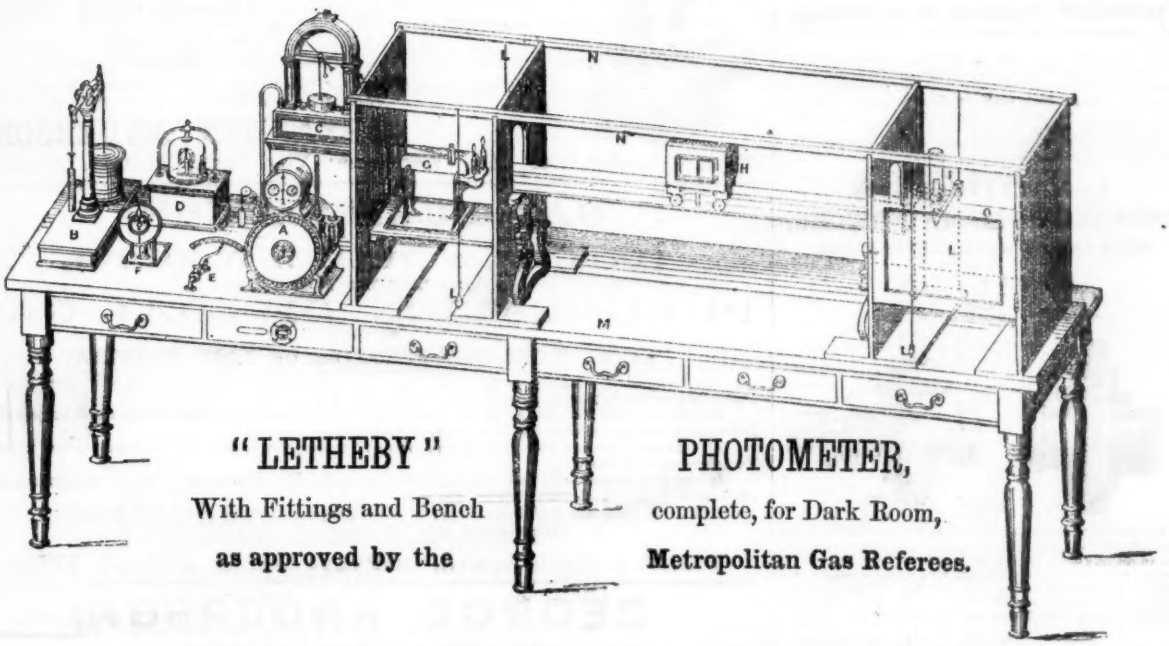
It has greater durability in colour, as sulphurous gases do not blacken it as they do white lead.

It is of a light stone colour, and has a body equal to white lead, and as its specific gravity is so much less, it covers equally well one-third more surface, by which a great saving is effected; a similar economy arises from its use in steam and gas joints, for which purpose it is superior to white lead.

# WILLIAM SUGG,

## GAS ENGINEER,

## VINCENT WORKS, WESTMINSTER, S.W.



"LETHEBY" PHOTOMETER,

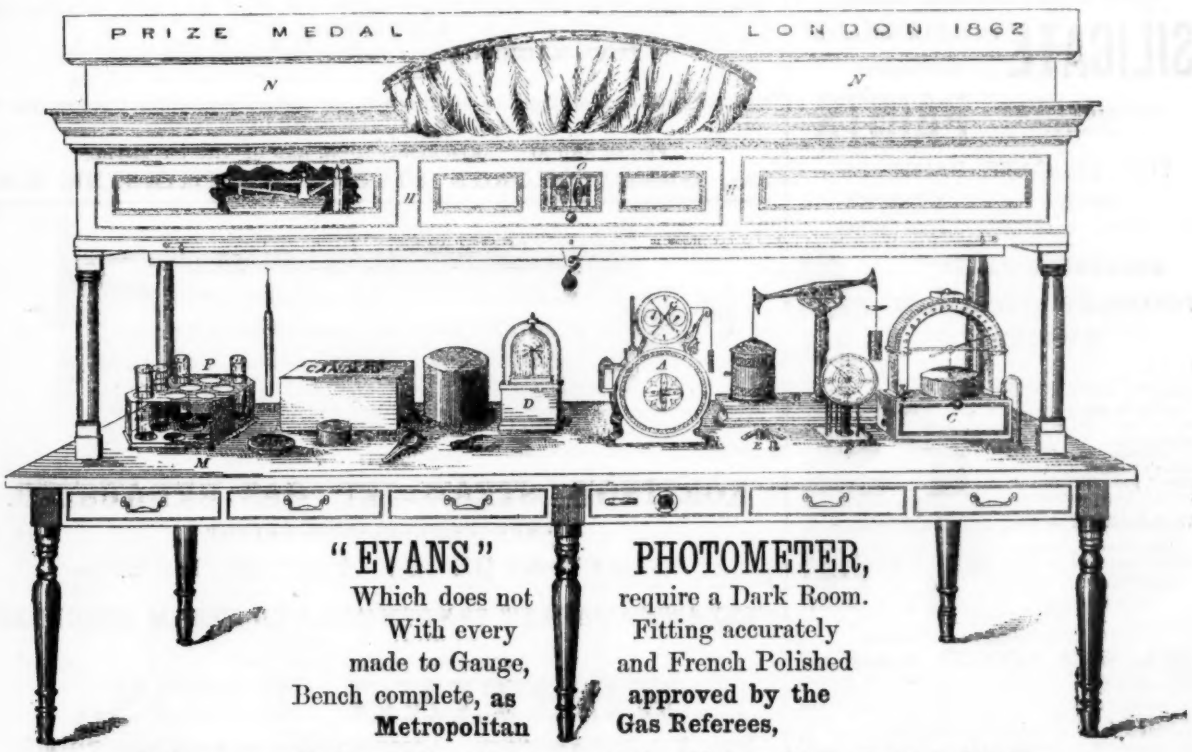
With Fittings and Bench complete, for Dark Room,

as approved by the Metropolitan Gas Referees.

## IMPROVED LOWE'S JET PHOTOMETER.

## WILLIAM SUGG'S PATENT ILLUMINATING POWER METER.

**All Kinds of Gas-Testing Apparatus of the most approved forms.**




"EVANS" PHOTOMETER,

Which does not require a Dark Room.

With every Fitting accurately made to Gauge, and French Polished Bench complete, as approved by the Metropolitan Gas Referees,

**And as supplied and fixed by me at the Metropolitan Testing-Stations.**

**Price Lists and all Particulars on application.**

**CATHELS'S Patent District Dry Gas-GOVERNOR** is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

**CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE** is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

**CATHELS'S Improved Retort-Settings.** Guaranteed to heat and wear well, with great economy of Fuel.

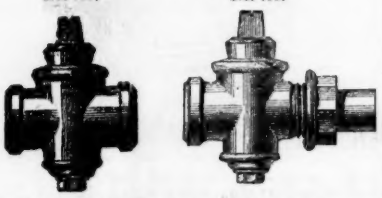
Coloured lithograph copies of Working Drawings of Beds of One to Seven Retorts (so clearly arranged and fully shown as to be easily understood by any retort setter or bricklayer) having been made of these valuable settings, they can now be supplied with detailed Specification immediately on receipt of orders.

Apply to Mr. THOS. NEWBIGGING, Consulting Gas Engineer, 5, Norfolk Street, MANCHESTER.

## LAMBERT'S
## CAST-IRON GAS-MAIN COCKS,
### WITH PATENT WHITE METAL PLUGS.

TRADE (L) MARK.

No. 758. No. 759.



The bodies of these Taps are made of iron, black or galvanized, and the plugs of patent metal. They are warranted not to set fast or corrode, as do Iron or Brass Cocks; will always work easily; are strong, well made, durable; of little or no intrinsic value, and therefore not likely to be stolen; and the prices as stated below are (especially upon the larger sizes) fully 50 per cent. less than Brass Cocks.

| | ½ | ¾ | 1 | 1¼ | 1½ | 2-inch. |
|---|---|---|---|---|---|---|
| No. 758, with inside screws for iron pipe, black . . . . . | 2/0 | 3/0 | 4/4 | 6/6 | 7/6 | 12/0 each. |
| No. 759, with union on one end screwed inside for iron pipe, black . . . . . | 2/9 | 3/10 | 5/4 | 8/0 | 9/0 | 15/6 each. |
| Nos. 758 and 759, galvanized . . . . | 0/3 | 0/1 | 0/6 | 0/8 | 0/10 | 1/4 extra. |

MANUFACTORY:
**SHORT STREET, LAMBETH, LONDON.**

## SILICATE PAINTS.
**THE BEST & CHEAPEST**

For every purpose to which Paint is applied.

MANUFACTURED IN ALL COLOURS BY

THE SILICATE PAINT CO.,

| LONDON— | LIVERPOOL— |
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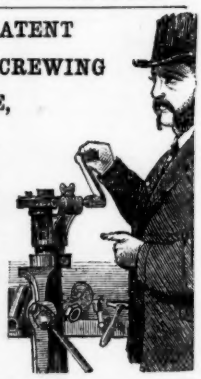
| 107, CANNON STREET, E.C. | SEEL STREET. |

## GRIRDROD'S PATENT
## PORTABLE PIPE SCREWING MACHINE,



For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

**W. H. BAILEY & CO.,**

Brassfounders, Gauge njector and Tool Makers,

ALBION WORKS, SALFORD, LANCASHIRE.

TO INVENTORS AND PATENTEES.

**MR. W. H. BENNETT,** having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

## GREAT SAVING OF LABOUR.
## ENOCH'S PATENT
## PORTABLE DRILLING-MACHINE,

Now in use by all the Principal Gas and Water Companies in the United Kingdom.

| | |
|---|---|
| E Size, for Services in Pipes, 2 to 3 in. bore . . . . . | £3 10 0 |
| F Size, for Services in Pipes, 2 to 4 in. bore . . . . . | 4 0 0 |
| G Size, for Services in Pipes, 2 to 6 in. bore, with Telescope Cramp. | 4 10 0 |

Drills, 1s. 6d. each.

Machines sent on approval, if desired.

*Prices for other Sizes and Modifications, with full Particulars and Testimonials, on application to*

**ALEXANDER ANDERSON,**

Office: 9, London Street, E.C. Warehouse: Vine Street, Minories, London, E.

## GAS PURIFICATION.
### BAILES & HALLSWORTH,
CONTRACTORS FOR THE
### PURIFICATION OF COAL GAS
BY THEIR
**PATENT HYDRATED PEROXIDE OF IRON MATERIAL.**

The Material is adapted specially for taking up sulphuretted hydrogen, and will simultaneously absorb any ammonia that may pass the scrubbers.

The spent oxide resulting from our Material is more valuable than that from natural oxide of iron, and manufacturing chemists buy it in preference.

The Material has now been in use during the past three years in most of the principal Gas-Works in Yorkshire and elsewhere.

It contains considerably less moisture than natural oxide of iron, and is much cheaper and more efficient as a purifying agent.

B. & H. are purchasers of Spent Oxide, or will take Spent in exchange for New Material.

FOR SAMPLES AND TERMS, ADDRESS—

**BAILES & HALLSWORTH, COPPERAS WORKS, ARMLEY. LEEDS.**

## GEORGE ANDERSON,
GAS AND CONSULTING ENGINEER,
### 35A, GREAT GEORGE STREET,
**WESTMINSTER, S.W.,**

**PATENTEE and MANUFACTURER of the following Invention**

**RETORT SETTINGS**—giving great Economy of Fuel.

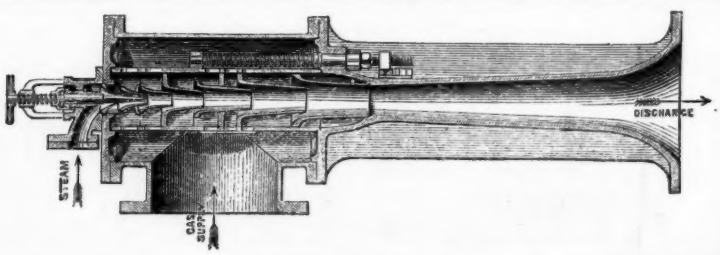
**STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.**

**FUEL-MACHINE, for Compressing Breeze and Tar.**

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

**35a, GREAT GEORGE STREET, WESTMINSTER, S.W.**




## KÖRTING'S STEAM-JET GAS-EXHAUSTER.
IMPROVED CLELAND'S PATENT.

UPWARDS OF 250 IN USE.

**CLELAND'S PATENT CONDENSER AND STEAM SCRUBBER.**

*FOR PARTICULARS, APPLY TO*

## KÖRTING BROS.,
**17, LANCASTER AVENUE, MANCHESTER,**

OR TO

**GERALD J. TUPP, 8, John Street, Adelphi, W.C., LONDON,**

SOLE AGENT FOR ENGLAND AND WALES.

## NOTICE.

# THE GAS & WATER COMPANIES DIRECTORY, 1878.

(WATER SECTION.)

The Editor will feel greatly obliged if Secretaries and Engineers would fill up, and return to him at once, the forms sent them, as the work is now going to press. If any have not received Forms, they will be forwarded immediately, on application to the Editor,

**CHARLES W. HASTINGS,**
8, BUCKINGHAM STREET, ADELPHI, LONDON, W.C.

---

## JAMES MILNE & SON,

GAS ENGINEERS,

**Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,**

EDINBURGH, AND

**2, KING EDWARD STREET,**

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

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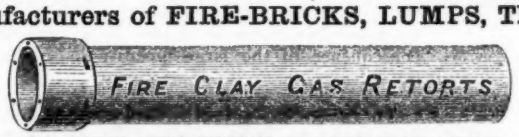
## JOHN HALL AND CO., STOURBRIDGE,

**Manufacturers of FIRE-BRICKS, LUMPS, TILES,**




**AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.**

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

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## J. & J. BRADDOCK,

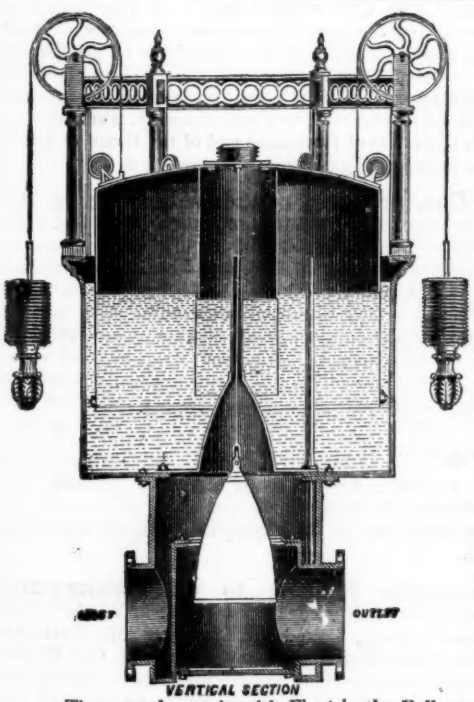
GLOBE METER-WORKS,

**OLDHAM,**

Beg to submit to Gas Engineers their

# PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.




VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

---

## ALFRED LASS,

SPECIAL ACCOUNTANT FOR GAS COMPANIES,

30, GRACECHURCH STREET, LONDON.

*Accounts analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.*

The Forms of Account, which have been specially designed by A. L. to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, and have been universally approved.

The above forms are registered.

*Water Companies Accounts also prepared and adjusted.*

CONSULTATIONS.

---

## T. NEWBIGGING,

**CONSULTING GAS ENGINEER,**

5, NORFOLK STREET, MANCHESTER.

---

## MR. EDWARD SANDELL,

Associate of the Society of Accountants in England, Publisher of the "Gas Companies Expenditure Journal,"

Begs to announce his REMOVAL from Skinner's Place, Size Lane, to

**No. 2, GT. GEORGE STREET, WESTMINSTER.**

---

## Mr. ROBERT DEMPSTER, Sen.,

CONSULTING GAS ENGINEER,

Of Messrs. Robert Dempster and Sons, Rose Mount Gas Engineering Works,

**ELLAND, near HALIFAX,**

May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Our R. D., Sen., having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations, is both extensive and reliable.

---

REMOVAL.

**CHARLES HEISCH, F.C.S., Analytical** and Consulting Chemist, Superintending Gas Examiner to the Corporation of London, &c., &c., has REMOVED from 8, Savage Gardens, to 79, MARK LANE, where he may be consulted as usual.

---

## JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

**CANNEL COAL FACTOR,**

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTER-MIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

---

## THOMAS CARR & SON,

MANUFACTURERS OF

**FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,**

SCOTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE,

Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

---

## BIRTLEY IRON WORKS,

CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

---

## BOUCK & CO., LIMITED,

TAR DISTILLERS & MANUFACTURING CHEMISTS,

**MILES PLATTING, MANCHESTER.**

BRANCH WORKS, BLACKBURN.

**BUYERS OF COAL TAR,**

And Crude Products therefrom,

**AMMONIACAL LIQUOR, &c.**

---

## MR. HENRY GORE,

**CONSULTING GAS ENGINEER AND SCIENTIFIC REFEREE,**

Begs to inform his friends in the Gas Profession that his Business Address in London, from and after this date, will be

No. 1, GT. COLLEGE STREET, WESTMINSTER, S.W.,

Where he can be seen by appointment any day between the hours of 10 a.m. and 3 p.m.

---

**TO GAS-METER MANUFACTURERS.**

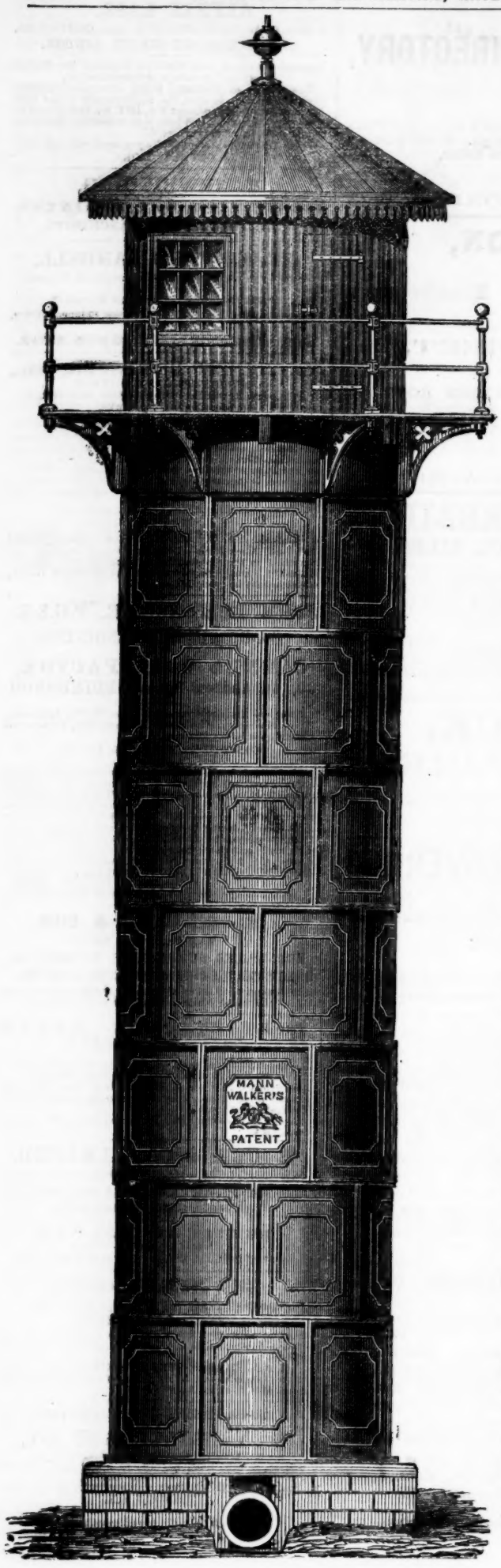
## G. A. BAILEY AND CO.,

MANUFACTURERS OF EVERY DESCRIPTION OF

Station, Hourly Rate, Experimental, and other Indexes, Wheel and Worm Cutters,

86, CRAMPTON STREET, NEWINGTON BUTTS, LONDON, S.E.

N.B.—Materials found or otherwise.




C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

# MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

**By some important improvements recently** patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

**It is to be particularly noted that the im-**portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

**Fifty million cubic feet of gas per 24 hours** are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

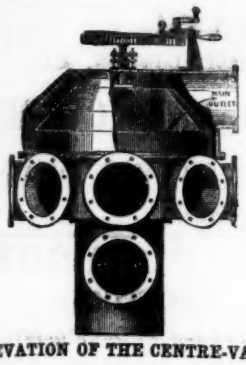
**Generally, wherever a high standard of** purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

**By their use the department of purification** from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

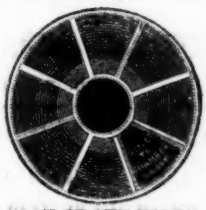
**Foul Gas, properly condensed, entering the** inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

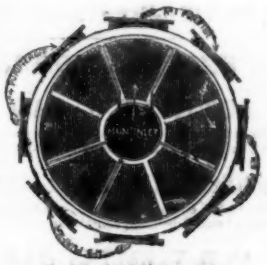
**They contain their own engine power, re-**quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

**Applications relating to dimensions and** prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.



# C. & W. WALKERS'
# PATENT CENTRE-VALVES.





ELEVATION OF THE CENTRE-VALVE. PLAN OF THE VALVE. PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

---

# W. C. HOLMES & CO.,

WHITESTONE IRON-WORKS, HUDDERSFIELD,

MANUFACTURERS OF

**RETORTS, ANNULAR AND PIPE CONDENSERS,**

WROUGHT AND CAST IRON SCRUBBERS, PURIFIERS, GASHOLDERS,

**GOVERNORS, AND ALL THE NECESSARY FITTINGS FOR COMPLETING THE ERECTION OF GAS-WORKS.**

STATION & CONSUMERS WET OR DRY METERS, STREET & SERVICE MAINS, LAMP COLUMNS & BRACKETS, & WROUGHT-IRON TUBES AND FITTINGS; WROUGHT-IRON ROOFS FOR ANY SIZE OF BUILDINGS.

**Sole Makers of B. W. Thurston's Combined Condensing, Scrubbing, and Washing Apparatus,**

AND PATENTEES OF THE IMPROVED COMBINED CONDENSING AND PURIFYING APPARATUS SO EMINENTLY ADAPTED FOR EXPORTATION.

REFERENCES TO UPWARDS OF 300 GAS-WORKS.

---

# FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER;

Manufacturers of

## IMPROVED CONSUMERS WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

**STATION-METERS OF ALL SIZES, with PLANED JOINTS;**

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS.

**And all kinds of Experimental Gas Apparatus.**

---

# MESSRS. NEWTON, CHAMBERS, & CO.,

**THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD,**

MANUFACTURERS OF

## IMPROVED CENTRE-VALVES,

**PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,**

**And every description of Gas Machinery.**

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

## ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

### SHOTT'S BOGHEAD.

### LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

### MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

### OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

*Prices and full Analyses on application.*

GAS COAL.

**POPE & PEARSON, LIMITED, have** now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

## SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

*Established* 1840.

## HEBBURN MAIN GAS COALS.

T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,534 cubic feet per ton of 14½-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9866 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

PRICES ON APPLICATION, EITHER F.O.B. OR BY RAIL IN TRUCK LOADS.

THE TYNE COAL COMPANY, LIMITED, OWNERS,
W. RICHARDSON, Fitter,
29, QUAYSIDE, NEWCASTLE-ON-TYNE.

## FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

## THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

## NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

## WILSON CARTER AND PEARSON,

## GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES:

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

## CANNEL COAL.

ELLIS LEVER & CO., Central Coal Offices, 46, Cannon Street, London, E.C., and 6, Piccadilly, Manchester, are prepared to contract for the supply of THE BEST CLASSES of CANNEL and GAS COAL, for long or short periods. Analysis and prices on application.

## ELLIS LEVER & CO.,

CANNEL AND GAS COAL CONTRACTORS,

**Shippers of Steam and House Coal**

AT ALL

**ENGLISH, SCOTCH, AND WELSH PORTS.**

46, CANNON STREET, LONDON,

AND

6, PICCADILLY, MANCHESTER.

ECONOMY IN THE PRODUCTION OF GAS.

## PLUTONIC CEMENT,

For Jointing and Repairing Retorts and Ovens *in* action and *out* of action.

A Pamphlet on the advantages of the above, with modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, GAS AND HYDRAULIC ENGINEER,

CHARLES HENRY STREET AND BISSELL STREET, BIRMINGHAM.

## THE WIGAN COAL & IRON COMPANY,

LIMITED.

DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN;

**Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.**

**N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.**

# ALBERT GAS COAL.

THE DERBYSHIRE

## SILKSTONE COAL COMPANY,

**LIMITED,**

CAN OFFER A

## GAS COAL

Of superior quality, delivered in trucks at any Railway Station in England, or shipped on board at Hull, Grimsby Docks, or Barrow-in-Furness.

| | |
|---|---|
| **Purified gas per ton of coal in cubic feet (average)** | **10,775** |
| **Illuminating power in candles** | **14·71** |
| **Weight of coke in lbs. per ton of coal** | **1,502** |

ANALYSIS AND PRICES ON APPLICATION TO

**Mr. EDMUND TAYLOR, Secretary,**

**ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.**

# THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

**DODWORTH, BARNSLEY.**

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

## REAL OLD SILKSTONE GAS COAL.

**JAMES PATERSON Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—**

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

**PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.**

# HYDRATED PURIFYING MATERIAL.

**Samples on application.**

## MESSRS. SPENCE BROS., LIMITED,

**Will be glad to supply the above on the most favourable terms,**

And to treat, by Purchase or Exchange, for Spent Oxide.

**PRICES ON APPLICATION.**

ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

**VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.**

Established

1795.

## JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

**NEAR LEEDS,**

**London Wharf: No. 4 inside Great Northern Goods Station, King's Cross, N.;**

**LIVERPOOL: Back Leeds Street.**

SPECIAL NOTICE.—Our Patent Machine-made Retorts have now been in *actual work* nearly 1000 days, and are yet in good order. References on application.
*July* 2, 1877.

# NEWTON, CHAMBERS, & CO.,

## THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

## CELEBRATED SILKSTONE GAS COALS.

**The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.**

**A recent extensive development of the Collieries enables us to offer increased supplies.**

**JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—**

*"Warrington Gaslight and Coke Company,*
*Offices, Mersey Street, Warrington, April 23, 1877.*

"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

"The average of Nine samples gives a yield of **12,500** cubic feet of **15½**-Candle Gas, being equivalent to **664** lbs. of sperm per ton, and **1420** lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

"Yours truly, "JAMES PATERSON."

**Full particulars will be sent on application to us—address as above.**

# CROLL'S
# DRY GAS-METERS,

PRIZE MEDALS.
LONDON, 1851;
NEW YORK, 1853
PARIS, 1855.

(INVENTED & PATENTED IN 1844,)

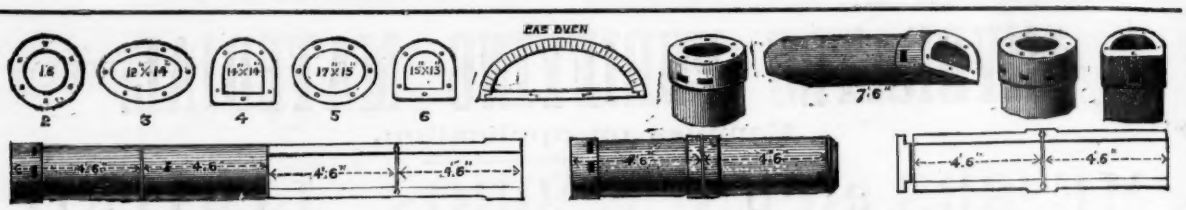
COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

PRIZE MEDALS
LONDON 1862;
DUBLIN, 1865;
PARIS, 1867

## THE GAS-METER COMPANY, LIMITED,

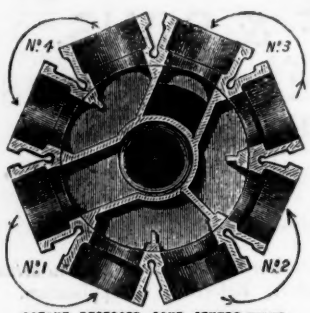
238, KINGSLAND ROAD, LONDON, N.E.




## HARRIS & PEARSON, STOURBRIDGE,

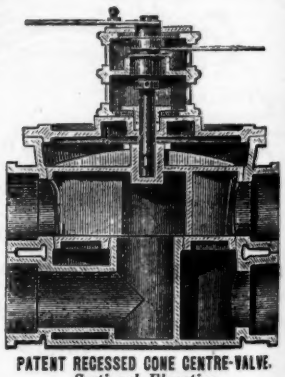
Proprietors of Best Clay Mines. Largest makers in the World of Gas-Retorts, Lumps, Tiles, Fire-Bricks, and Fire-Clay Goods of all kinds. Large Stock of Retorts always on hand. Orders for any Size executed on receipt.

## CAST-IRON GAS AND WATER PIPES,
### WROUGHT IRON AND LEAD TUBING, GLAZED DRAIN-PIPES,
### STAFFORDSHIRE BLUE BRICKS.



PATENT RECESSED CONE CENTRE-VALVE.
*Sectional Plan.*

## R. LAIDLAW AND SON,
### EDINBURGH AND GLASGOW,
SOLE MAKERS OF
PATENT
RECESSED CONE CENTRE-VALVES,
Constructed on the principle of the ordinary Plug-Cock.
THROUGH-WAY & FOUR-WAY COCKS
Of all descriptions.


PATENT RECESSED CONE CENTRE-VALVE.
*Sectional Elevation.*

LONDON OFFICE: 106, CANNON STREET.

## D. HULETT & CO.
Invite the attention of Gas Companies, Corporations, and others to their
### PATENT STREET LAMPS,
Which are so constructed that neither putty nor other materials are required to secure the glass. No hacking out of old putty, which frequently destroys the frames. A new pane of glass can be inserted in two or three minutes by any inexperienced person, the glass being secured by a hinged flap and turn button.

PRICE 10s. each, net. Special quotations for large quantities.
Also made EXTRA STOUT recommended for its durability, PRICE 11s. 6d. each.

**D. HULETT'S IMPROVED SERVICE CLEANSER,**
By the use of which stoppages in service and other pipes are freed from naphthaline and other obstructions in a few minutes. PRICE 73s. net.

**HULETT'S PATENT MERCURIAL REGULATOR,**
For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

PATENTEES OF IMPROVED WET AND DRY GAS-METERS.
**Makers of all kinds of Pressure-Gauges, Gaseliers, and every kind of Gas-Fittings for the Trade.**
GAS HEATING AND COOKING STOVES.

**55 and 56, HIGH HOLBORN, LONDON.**


London: Printed by WILLIAM BOUGHTON KING (at the office of Clayton and Co. 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, June 18, 1878.